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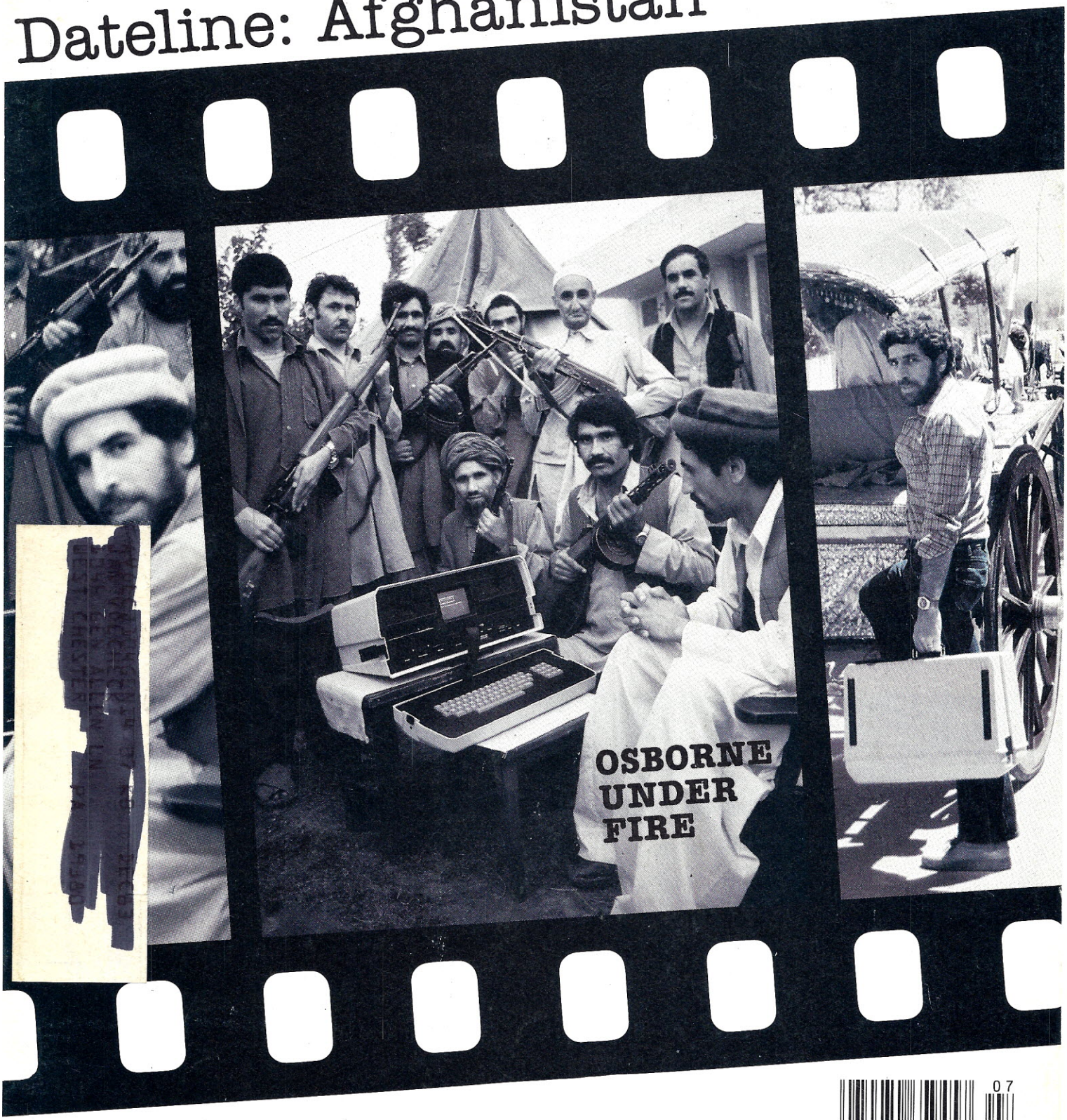

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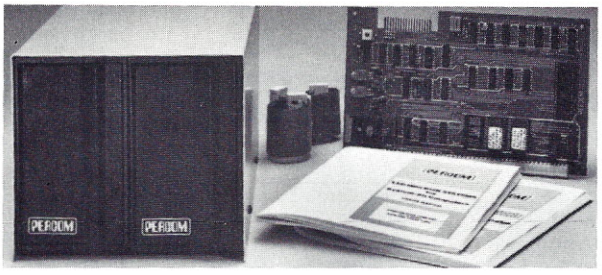

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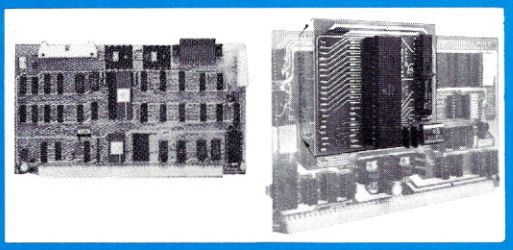

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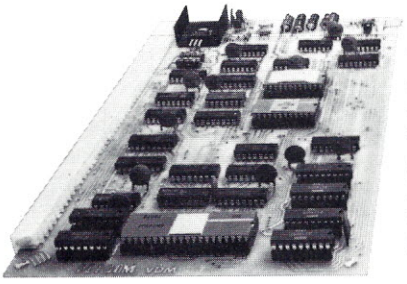

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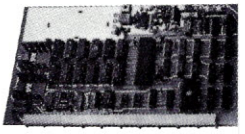

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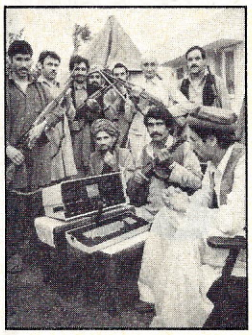

MICROCOMPUTING

On the cover: Microcomputing entered a new era recently when journalist David Kline, on assignment for CBS-TV, *Los Angeles Times* and *Chicago Sun-Times*, took along his Osborne portable computer to report on the guerrilla war in Afghanistan. It marked Kline's fourth visit to that country in three years, but the first using a microcomputer in the war zone to both write and file stories back to the U.S. Kline snapped the center cover photo of Afghanistan independence fighters while camped at a guerrilla hideaway somewhere near the Afghanistan-Pakistan border. Photo on the right (by Impact Features) shows the author boarding a rickshaw to transmit a story from Peshawar, Pakistan, just below the Khyber Pass. Left photo (by Impact Features) shows Kline at the rebels' hideaway.

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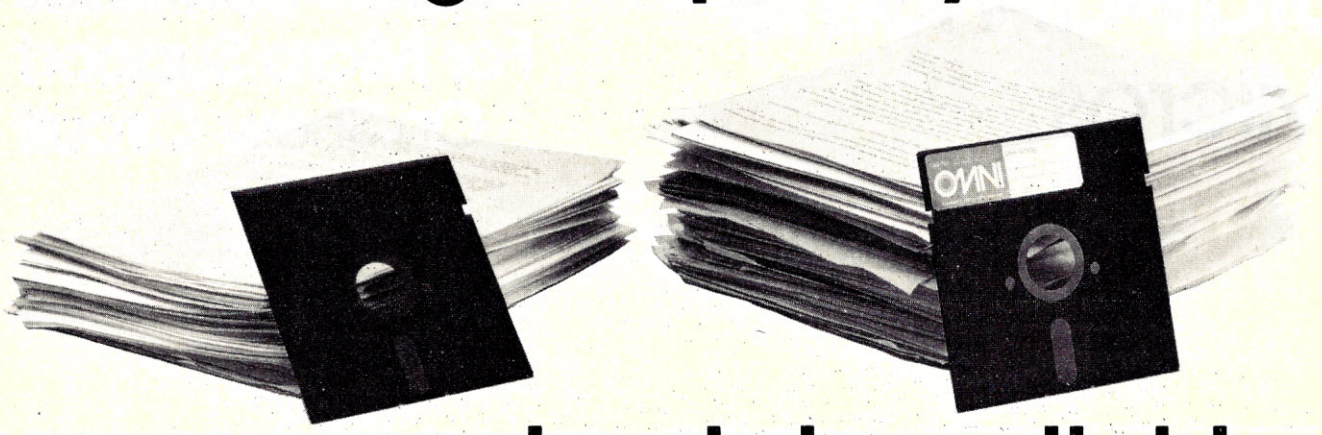

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By Wayne Green

Stay-at-Home Micros

Search Continues For Micro Support On Show Circuit

The Shows— How Are They Shaping Up?

With up to nine or ten shows some months, there is no way for manufacturers to exhibit at even a small percentage of them. But how much real value can strictly local shows be for people interested in seeing computers? To get a feeling for how things are going on the show circuit, I spent a weekend making a pass at three of the shows.

The first was in Dallas. While the show was perhaps a bit scant from the viewpoint of the customer, there were enough real exhibitors to keep most people happy. I say real exhibitors because I tend to be less than seriously interested in paying $7.50 to talk with representatives of investment firms, executive search firms, encyclopedias, forms manufacturers, packaging firms, banks, newspapers, copiers, office furniture, pocket pagers, intercom systems, and stuff like that. Well, you get a generous helping of these hangers-on at shows.

Another turn of events at shows has been the increasing entry of minicomputers such as Cado, Wang, and a seemingly unending number of others with which I am only passingly familiar. The Dallas show was made up of about 30 percent of these higher-priced, and usually less flexible, types of systems. I do sort of enjoy saying hello to the people selling these systems because they generally have such a total lack of knowledge of microcomputers. Oh, they know that micros are just toys and not for serious office work. Good game machines. But (suppressed chuckle), how can anyone seriously even consider using a toy like that for word processing?

Quite a few times I've tried to approach the minicomputer sales firms and understand what their system could do for me. Within minutes I'm almost totally confused. If these chaps are actually selling systems the buyers must be making their choices by throwing a dart at a list on the wall.

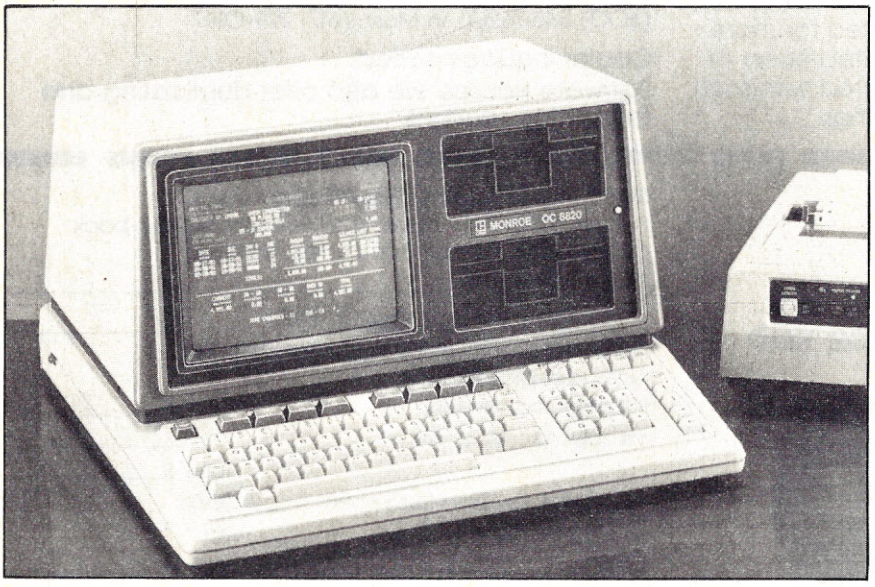
Most of the microcomputer sellers were cooperating with the mini people to the fullest. They had their systems set up and manned by kids playing space invader games. Not that anyone could really get an understanding of what a word processor could do in a two-minute demo, or begin to understand the possibilities of an Easy-Calc program in all that hubbub.

I talked with the exhibitors, who were generally happy about the customers. Some stores said they had had more good customer prospects on the first day of the show than they needed to make the effort pay. Thus, with both the exhibitors and the customers happy, the show should be judged a success.

There was one note of bitching by both the exhibitors and the customers. They expected to see certain manufacturers, as advertised, at the show. But these manufacturers didn't attend. Having been in the show biz in the past, I understand the problems. The show firm knows that customers want to see all of the best-selling systems and so they promise them, hoping they will be covered by dealers showing the products.

Dallas on Thursday, St. Louis on Friday. The show here was downtown at the huge Cervantes Center. It was put on by the Interface Group and was substantially smaller than the Dallas show. I'd judge the mix about 50 percent micro and 50 percent mini, not counting all of the non-computer exhibits. Again the exhibitors and attendees both seemed happy with the show. Like Dallas, the traffic was brisk, with enough customers to keep most booths busy, but not enough to cause pileups.

At one exhibit in St. Louis, a chap at a booth was telling anyone who would



Monroe Systems, of Morris Plains, NJ, exhibited their new eight-bit business computer at the St. Louis show. It runs the proprietary Monroe Operating System, and Monroe is offering company-developed applications software. The Model OC 8820 Occupational Computer with video display and dual disk drives sells for $4385.

listen that he would be foolish to buy a computer. His company, you see, provides a remote data processing service. I asked about word processing, which could be provided over the telephone line according to this business rep. Hmmm. What about financial analysis? The chap didn't seem to know what that was, but he was sure that I did not need a computer. Perhaps he was right.

I'd say there were around 80 or so exhibitors at Dallas, about 55 at St. Louis and a bit fewer at Boston, my last stop on the trek. The Boston show, also put on by The Interface Group, was about 75 percent minicomputers. There was a big tent full of Commodore systems at the entry to the show, and a wall of TI systems—all playing games. Beyond that it was almost solid minicomputers. You know, DEC, Wang, and so on.

There was one surprise at Boston—a new microcomputer. This was a new entry from the publishers of *Micro* magazine. Yep, now they're in the micro manufacturing business. Just what the industry needed—another micro!

Radio Shack was totally invisible at Boston. I didn't see a single TRS-80 anywhere! Maybe my head was spinning from all the big machinery and I missed one somewhere. Most of the other micros were missing too, so perhaps I shouldn't single them out. I saw an Apple that was being given away as a prize. Didn't see any others—no Heath, Exidy or about 75 other different microcomputer systems.

I also heard a lot of griping from the customers about this—and equal griping from some of the exhibitors of big ticket hardware that there were few, if any, customers for their stuff. Within about two hours I'd managed to say hello and talked with every exhibitor who had ever heard of Wayne Green. Dallas took me a solid five hours for the same stint—and St. Louis about four.

Desktop Visibility

While few of the minicomputer-selling firms had ever seen or heard of this magazine or *80 Micro*, most of these were familiar with *Desktop Computing*. We're doing something right. Given their mind frame, this is understandable. These people really believe that an Apple with word processing is about equivalent to trying to write with a $25 toy typewriter. They're OK if you want to try and get along with something not much better than a hand calculator, you know.

I don't recall seeing a single IBM micro at any of the three shows. A Radio Shack store was exhibiting at Dallas, an Apple dealer at Dallas, Altos at St. Louis, and, hey, Monroe had a very nice looking micro at St. Louis! The welter of software minibooths were missing. I think the only significant software sales at Boston were from the Instant Software booth.

The Interface Group has come into the micro field from the minicomputer industry, so the preponderance of mini exhibitors is natural. Milden, who ran the Boston show last year, which was so heavy on minis, was more micro oriented at Dallas.

Xerox was almost invisible, as was TI, except at Boston. Even Commodore was present only at Boston, with little representation elsewhere.

With close to 100 different microcomputers on the market, one might wish there was some way to get more of these systems together so prospective customers could see them in action. Perhaps, if the manufacturers could have a couple professional-looking exhibits made up to be shipped around for local dealers to use, this would keep the cost down and still allow the system to be seen and demonstrated in these small local shows.

The need for better-looking exhibits in the booths is epidemic. Even the West Coast Computer Faire seems to have degenerated to a welter of small firms with instant exhibits made with magic markers and taped up sheets of paper. This is OK for computer hobbyists, I suppose, but is hardly apt to give an impression of stability to newcomers.

Hard Disk Backups

You know, if I had a college which taught computing, I'd fill a small lab with eager teenagers working on a new recording system to provide a dependable, low-cost backup for the proliferating hard disks. This is one of the most neglected aspects of microcomputers.

The first microcomputer on the market, the Mits Altair, used a cassette storage system. To say that it didn't work very well is quite an understatement. In fact, if there hadn't been so many other parts of the computer that also didn't work well, the cassette recording system would have been a scandal.

As near as I could piece out what happened, someone at Mits grabbed a cheap cassette recorder and banged some audio tones on it. When they played it back into the computer it occasionally worked. They apparently didn't have time to go out and find someone with experience in putting digital signals on tape.

There's no indication that much more research went into most of the cassette digital recording systems that followed. I recognized the problem back in September 1975 and organized a meeting of the microcomputer industry to tackle the problem. This meeting was held in November 1975 in Kansas City, with every major manufacturer present. The Kansas City Standard for cassette digital recording was established there.

Unfortunately, it was at this precise time that I suddenly found *Byte* taken out of my hands. By the time I had a new magazine for the field started (this one), it was too late to try and make the new "standard" stick. The people who took *Byte* from me seemed to care little about any of this, so they did nothing to get the manufacturers to support the prosposed standard.

The audio people have been pursuing their ends, and have been doing some remarkable work on getting a lot of music on a little bit of tape. They've crammed four channels on one-eighth inch of cassette tape—with darned good response, too. It's now time for some group to see what can be done about putting our blessed digital signals on these cassettes.

For instance, if we set up a cassette recording system that lays down the four channels all at the same time, we could get a lot of density on the tape. We're doing something like this with our hard disk systems, which record on both sides of two disks at the same time, splitting the data between the four faces.

Perhaps we need to experiment with something more analog than digital in technique. We might use two tones on each of the four channels, thus being able to put our bytes down one at a time on the tape. Or we could use four tones and thus get nine combinations of tones to represent eight bits and a parity bit. In this way we might be able to use the four channels for four bytes at a time.

With a C-120 tape we would have a one-hour four-channel tape. Since we would use this for hard disk backup—not for any use other than in an emergency—the speed of the system is almost irrelevant, as long as it is inexpensive and error free. By using tones we might not need the special tape formulations that are such a nuisance for most of our present digital systems. We might be able to get away with using a good high-quality music tape, which would be relatively inexpensive.

In the seven years I've been publishing about microcomputing, I don't recall any definitive article on audio tape recording. It is almost time to do the work that should have been done years ago and come up with a good cassette recording system for hard disk backup. I'll tell you this, it will sell.

It's time to try some tone recording of our bytes, too. By using separate tones or even pairs of tones in frequency or phase shift, we might be able to put each byte down simultaneously on the tape channels. We have some remarkable ICs for separating tones these days. There are many techniques that should be tried.

A Further Idea

Once we have a good cassette recording system we might be able to use it for one other backup service. Since there are plenty of low-cost, battery-operated cassette drives, how about arranging to put a battery backup on our computer memory if the power suddenly goes off? Then we could dump the memory onto the cassette tape, running the recorder with Nicads, which are normally on a floating charge from the system.

You know how disastrous it is trying to get things back into operation after a momentary power glitch, or after someone trips over the computer power cord. It would be a whole lot easier to have the computer memory automatically saved when the power fails.

Security

Have you wondered at the almost total lack of articles on security for small computers? Oh, you'll find many of them in the professional magazines on large systems, but for some reason there has been a lack of interest for our micros.

As microcomputers are used more and more for business purposes, we must have some security for our data. Most small and medium businesses like to keep salary levels confidential. But if the payroll is kept on the computer, what is to stop anyone from running off a copy of it?

One approach is to build in some passwords that will restrict the access of data to those who are supposed to use it. But you know as well as I that it doesn't take much of a software technician to find a way around most of these software systems.

The executive who has all of the sales figures for the firm in his computer so he can print out sales charts or look at projections of sales really doesn't want to have to worry about his data being stolen.

Sales, income, payroll and many other figures are best kept confidential. We need to have far more secure systems for handling these sensitive business figures. We don't want employees to be able to run off copies of anything they want—during the day or night. We don't want competitors getting our data—from a bribed employee, a disgruntled fired employee or by industrial espionage. Believe it or not, we've been broken into and had things stolen from us by a competitor. And that's up here in Peterborough, New Hampshire!

Government Secrecy

For years anyone doing much work with encryption found themselves up against the government. There was—and still is, I believe—strong pressure to keep the whole subject quiet and out of print. The government doesn't want Russia to know how smart we are at codes, so there has been a lid on the subject. They also don't want anything published that might possibly help Russia.

Well, that's OK, as long as it doesn't get in the way of some of the simpler encryption ideas that would benefit small business. I don't expect that we'll need to get into codes that would require a Cray computer a week to tackle.

Speaking of that, I gather that the federal data encryption standard may have been designed specifically so that it *could* be broken by government computers.

The field is an arcane one and, while most of us would get lost trying to keep up with the methods of breaking codes, we still need to know how to apply them to our computers.

Articles on the use of encrypting data for micros are in order at this time. While there are some benefits to having the data in unencrypted form in your own computer and just encoding it when the data is being sent over lines to another system, our best bet is to put the data on our disks in coded form so that even if the disk is stolen or accessed the data will not be readable.

Most professionals want to be able to keep their data in a secure form. Doctors must have good patient records, but they should be private. Psychologists have an even greater need for privacy—as do consultants, lawyers, and so on. We need some good security systems for our micros and we need 'em now.

I'm looking for articles to help us with this. I'm not, as I said, interested in esoteric cryptologica, just in practical systems that readers will be able to use. The solution can be software or a combination of some simple hardware and software—or whatever will do the job effectively without being too complicated.

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IBM - HARMONICA ½". SERIES I. MOD 4973/II, 3200, 3289, MOD 2.	3/pk	9.42 ea	20.85/3 pk	*(6.95 ea)*	1 2" x 108'	Nylon Jet Blk	C-350
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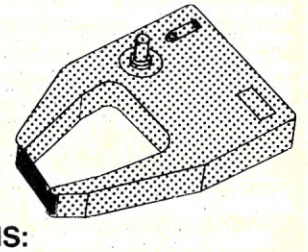
TELETYPE MOD 33, 28, 35, 37, 38, 88.	10/pk	2.40 ea	13.90/10 pk	*(1.39 ea)*	1/2" x 36'	Nylon Jet Blk	R-450
WANG M/S. 5541W, WC, 5581, WD, 6581W, 2281W	1/pk	6.85 ea	5.95 ea	*(5.95 ea)*	5/16" x 393'	Multistrike Film	C-550



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ZX81
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AND 2
THEN 3
TO 4
5
6
7
8
GRAPHICS 9
DELETE 0
PLOT Q " "
UNPLOT W OR
REM E STEP
RUN R <=
RAND T <>
RETURN Y >=
IF U $
INPUT I (
POKE O)
PRINT P "
SIN
COS
TAN
INT
RND
STR$
CHR$
CODE
PEEK
TAB
NEW A STOP
SAVE S LPRINT
DIM D SLOW
FOR F FAST
GOTO G LLIST
GOSUB H **
LOAD J -
LIST K +
LET L =
FUNCTION
ENTER
ARCSIN
ARCCOS
ARCTAN
SGN
ABS
SQR
VAL
LEN
USR
SHIFT
COPY Z :
CLEAR X ;
CONT C ?
CLS V /
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AT
IN KEY$
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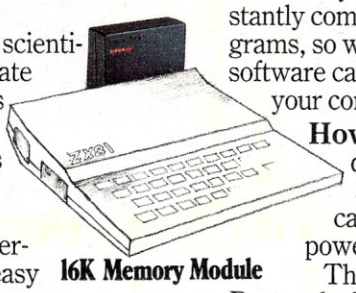
16K Memory Module

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

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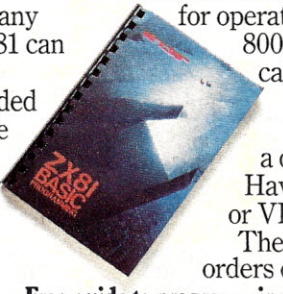

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Sinclair technology is also available in Timex/Sinclair computers under a license from Sinclair Research Ltd.

sinclair

Let's not get into details of how to break codes, just how to use them. I'm a crypto fan . . . to an extent. I can whip through the cryptos in the papers and puzzle magazines in record time, but still I'm not into it for more than just games. So, experts, tell us what we need to know.

Timex = Opportunity

Clive Sinclair has been doing a first-rate job of getting his ZX-81 computers into the hands of people interested in learning about small computers. He's been selling mostly via mail order so far. Starting in July, Timex will take over, selling the small computer through their chain of dealers. This is good news for you.

There will be a need for a wide range of articles on the system for us to publish in this magazine. People want to know what can be done with the system, what applications it can be used for, how it can be expanded and what accessories are available.

There will also be an almost endless need for software for the system. This is one of the first computers that can be called a home computer, so applications for the home and for the office at home will be needed.

Instant Software will be working to convert as many of their programs to the Timex as possible. They will be looking for new programs geared for this computer. The need is there and will be growing rapidly.

Programs are needed to make the TS-1000 into a calculator, a computer terminal, a small communications system for the office or perhaps a portable word processor like the Sony Typecorder. The TS-1000 could also be used for ham applications such as RTTY and CW, to read and write bar code and as a simple encrypting system to protect data and communications. Games, educational programs, scientific programs, all will be available in profusion for this system, and will perhaps be sold in K-Marts.

This is both good news and bad, to some degree. In the past it has been relatively simple to go into business as a software publisher with only two or three programs. By placing mail-order ads in this magazine, *80 Micro* and others, he could build up a respectable business. But this time we're looking at an infinitely larger market. This time the programmer who tries to work through a small firm can miss the boat, which looks as if it will be loaded with gold.

It is going to take a fairly good-sized publishing firm to tackle this order of magnitude of distribution. With a $100 computer we are not looking at $25 and $50 programs, we're looking at a market for $5 and $10 programs, sold by the tens and hundreds of thousands. Oddly enough, few of the "larger" software publishers have developed the organization and the equipment to deal with this type of mass marketing. Most of the larger firms got that way selling a few high-profit programs. This may turn that part of the market upside down.

Instant Software is still looking for reps to cover a few parts of the country. These reps work 100 percent for the firm, visiting computer stores, book stores, electronic stores . . . and perhaps K-Marts to distribute software, books, magazines, and so on. Anyone with some enthusiasm can do very well. If you're looking for something with a big future which you can start at home, think in terms of getting into this new field as a rep, a programmer or a writer. □

MICRO QUIZ

What Does This Program Do?

What number is printed when the following program is executed?

```
10 READ N, D
20 R = N - INT(N/D)*D
30 IF R ≠0 THEN N = D: D = R: GOTO 20
40 PRINT D
50 DATA 1430, 273
```

(answer on page 137)

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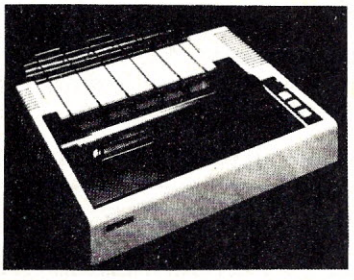

- EPSON MX70 ..... CALL
- EPSON MX80 ..... CALL
- EPSON MX80 F/T ..... CALL
- EPSON MX 100 ..... CALL
- NEC PC-8023A-C $555
- ANACOM ANC150P OR S $1195
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- NEC 3510-1, 3515-1, 3530-1 .... $1795
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0-8K . . . Sinclair ROM
8-16K . . . This section of memory switches in or out in 4K blocks to leave space for memory mapping, holds its contents during cassette loads, allows communication between programs, and can be used to run assembly language routines.
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32-64K . . . 32K of RAM memory for basic variables and large arrays. With the MEMOPAK 64K extension the ZX81 is transformed into a powerful computer, suitable for business, leisure and educational use, at a fraction of the cost of comparable systems.

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By Robert W. Baker

Keeping Up With Word Pro

Splitter Program Cuts Data Files Down to Size

Word Pro Splitter

Many user's groups and software houses use Word Pro to provide documentation on disk, instead of or in addition to providing printed documentation. This was all fine and dandy when Word Pro was the only version.

However, when the 80-column Commodore systems were introduced, along came Word Pro 4, and the even newer plus versions. Now there's a problem, since the newer versions only allow a little over 100 lines per file while the original Word Pro 3 allowed about 350 lines. Thus you may not be able to read some files created by Word Pro 3 if you're using the newer versions. The files are just too big to load into memory and no provisions were ever made in the newer Word Pro versions for reading partial files.

Here's a simple utility program that I recently wrote which should help solve the problem (see Listing 1). It lets you copy Word Pro files and split them into smaller files that can then be handled in the normal way by Word Pro. It does not, however, convert between Word Pro 3 and 4 formats of 40 or 80 characters per line. You can usually do this by hand, although it's time consuming. Or you can check my Word Pro Converter program that appeared in the Sept./Oct. 1980 issue of *Compute* magazine.

When this program is run, it first prompts for the name of the Word Pro file to be read. You can optionally specify the drive number by a leading 0 or 1, followed by a colon and the filename. When including a drive number you must enclose the entire input string with quotes to avoid input errors. If no drive number is given it will default to 0. The drive number can be specified in this manner in any filename entered to the program.

After successfully opening the input file the program will then prompt for the desired output filename. Again, you have the option of specifying a drive number in with the filename; when a specific drive number is not entered it will default to 0.

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.

Listing 1. PET utility for converting Word Pro files.

```
100 REM ********************************
110 REM
120 REM UTILITY PROGRAM FOR SPLITTING
130 REM  WORD PRO DATA FILES ON DISK
140 REM
150 REM ------------------------------
160 REM
170 REM
180 REM
190 REM
200 REM ********************************
210 :
220 PRINT"■W O R D   P R O   S P L I T T E R": PRINT
230 PRINT"DISK FILE NAMES MAY BE PREFIXED WITH"
240 PRINT"A DRIVE NUMBER AND COLON IF DESIRED"
250 PRINT"BUT MUST BE ENCLOSED IN QUOTES": PRINT
260 L=40 : REM ← CHANGE TO 80 FOR WORD PRO 4
270 L$="----------------------------------------"
280 POKE 59468,14 : REM UPPER/LOWER CASE MODE
290 D$(1)="R": D$(2)="W"
300 :
310 REM ----------
320 REM OPEN FILES
330 REM ----------
340 :
350 P$="READ INPUT": F=1: GOSUB 780
360 GET#1,A$,B$
370 CLOSE 2: M=1
380 P$="NEW OUTPUT": F=2: GOSUB 780
390 PRINT#2,A$;B$;
400 IF M=1 THEN PRINT"COPYING...": GOTO 420
410 PRINT"DELETING..."
420 PRINT L$
430 :
440 REM -----------
450 REM READ A LINE
460 REM -----------
470 :
480 FOR X=1 TO L
490 GET#1,C$: IF ST<>0 OR DS<>0 THEN 900
500 C=ASC(C$): IF C=31 THEN C=95: GOTO 540
510 ON (C/32)+1 GOTO 530, 540, 520, 530
520 C=C+64
530 C=C+64
540 PRINT CHR$(C); :IF M=2 THEN 560
550 PRINT#2,C$; :IF DS<>0 THEN 910
```

More

Listing continued.

```
560 NEXT X
570 :
580 REM ------------------------
590 REM CHECK FOR KEYBOARD INPUT
600 REM ------------------------
610 :
620 GET C$: IF C$="" THEN 480
630 PRINT L$
640 PRINT"■N■=NEW FILE, ■Q■=QUIT, ■C■=COPY, ■D■=DELETE"
650 PRINT"    ■SPACE■=CONTINUE IN SAME MODE"
660 GET C$: IF C$=" " THEN 400
670 IF C$="N" THEN 370
680 IF C$="C" THEN M=1: GOTO 400
690 IF C$="D" THEN M=2: GOTO 410
700 IF C$="Q" THEN 930
710 GOTO 660
720 :
730 REM ----------------------------
740 REM SUBROUTINE TO GET FILENAME
750 REM AND OPEN FILE FOR READ/WRITE
760 REM ----------------------------
770 :
780 PRINT P$;" FILE   .■■■";
790 INPUT F$: IF F$="." THEN 780
800 C$=LEFT$(F$,2): CLOSE F
810 IF C$<>"0:" AND C$<>"1:" THEN F$="0:"+F$
820 OPEN F,8,(4*F),F$+",P,"+D$(F)
830 IF DS<>0 THEN PRINT DS$: PRINT: GOTO 780
840 RETURN
850 :
860 REM ----------------------------
870 REM END OF FILE & ERROR CHECKING
880 REM ----------------------------
890 :
900 IF ST=64 AND DS=0 THEN PRINT L$: GOTO 930
910 PRINT: PRINT L$: PRINT"ST= ";ST
920 PRINT DS$
930 CLOSE 1: CLOSE 2
```

```
100 rem "Wordcraft files to screen or printer by Stephen C. Vautier 1982"
110 rem  sends wordcraft files saved as a
120 rem  "d" or "b" type file to ascii printer, cbm printer or screen.
130 rem  if your printer is a cbm model then delete
140 rem  lines 280-290
150 printchr$(147);chr$(17);chr$(17);chr$(17);"enter the name of the file"
160 print"that you wish to have printed"
170 input n$:n$=left$(n$,len(n$)-1)+"$"
180 print:print"options"
190 print"1) send file to screen":print"2) send file to printer"
200 print"3) both":input op
210 if op=2 or op=3 then open 2,4
220 if op=1 or op=3 then printchr$(14)"Press . to start and stop display"
230 dopen#1,(n$),d0:if op=1 or op=3 then print""
240 get#1,b$:if st=64 then 330
250 if b$=""then b$=chr$(0)
260 if op=2 or op=3 then print#2,b$;
270 if op=2 then 240
280 if asc(b$)>64 and asc(b$)<91 then a=asc(b$)+128:b$=chr$(a):goto 320
290 if asc(b$)>96 and asc(b$)<123 then a=asc(b$)-32:b$=chr$(a)
300 if b$=chr$(12) or b$=chr$(140) then gosub 370:goto 240
310 get a$:if a$="." then gosub 340
320 print b$;:goto240
330 close:end
340 get a$:if a$="" then 340
350 ifa$<>"."then 340
360 return
370 print:c$="press any key to continue"
380 printtab(40-len(c$)/2);c$;"";
390 get a$:if a$=""then 390
400 printchr$(147);chr$(17);chr$(17);chr$(17):return
410 end
```

Listing 2. PET program for printing Wordcraft source files. (Courtesy of Stephen Vautier, Allen Park, MI.)

Once the output file is opened, the program will copy each line read to the new output file while displaying each line on the screen. Each line should appear just as it normally would be displayed by Word Pro. If you press any key on the keyboard (except run/stop) while a line is being displayed, the program will stop at the end of that line and prompt for the action you want to take.

Pressing N will close the current output file and prompt for a new output filename. The new output file will be opened and the program will continue copying lines, but now to the new output file. This process can be repeated as often as necessary to create any number of smaller files from one larger Word Pro file. Each file can be uniquely named and can reside on either drive.

Pressing Q after stopping the display will close both the input and the output files and terminate the program. Thus, the remainder of the input file is simply discarded and will not appear in the last output file created.

The C and D keys let you resume reading the input file while copying or deleting the lines read. This lets you selectively delete blocks of text in the middle of a Word Pro file. You can toggle back and forth between copying and deleting as often as desired.

Pressing the space bar when the display is stopped will resume reading the input file while copying or deleting lines. This allows you to suspend and resume the display without affecting the current mode of operation. This gives you a way to pause the display if it is too fast for you to read.

The program is currently written for reading Word Pro 3 (40-column) files on a 40-column PET. If you have an 80-column CBM (8016, 8032, etc.) and you are reading Word Pro 3 files, then add a Print command preceded by a colon at the end of line 560.

```
560 NEXT X : PRINT
```

This will keep the display correct for the Word Pro 3 format of 40 characters per line.

If you are reading Word Pro 4 (80-column) files on any Commodore system, then change the value of L in line 260 from 40 to 80. The value of L controls the number of characters per line in the Word Pro files, and it must be set correctly to be able to later load the files created.

Word Pro text is saved as a memory dump; it shows as a program file in the disk directory. Line 390 writes the first two bytes of every new output file opened, with the first two bytes read from the input file when it was first opened (line 360). This sets the load address in each file to the correct address for Word Pro, as read from the original Word Pro file.

The characters in the Word Pro file are the same as those used when poking directly into the display memory. Lines 500 to 540 of this program show an easy

way to convert from the screen memory values back to the normal ASCII values for printing. However, a special test is added here in line 500 to fix the back-arrow character used by Word Pro.

So there you have it! I think the options I've included in the program provide all the tools you need to prepare a Word Pro file to load into memory with Word Pro. Just remember to suspend the display (by hitting any key except the run/stop) prior to entering any desired command letter. The commands are only recognized once the display is stopped, and you can only suspend the display at the end of a line. After you've hit a key wait till the end of the line before hitting anything else.

Wordcraft Utility

In January's column I included a utility for printing Word Pro source files from disk, including the Word Pro commands along with the text. Stephen Vautier, of Allen Park, MI, has a program that does the same thing for Wordcraft files (see Listing 2). His version has several options to allow printing on ASCII or CBM printers, or to just display the file on the screen. If you're using Wordcraft you may find this simple utility quite handy.

New VIC-20 Software

Transonic Laboratories recently announced several interesting programs for the VIC-20. Each of their currently available programs is provided on cassette tape with appropriate documentation for only $4.95 postpaid.

ROM Detective is a simple disassembler written in Basic. It lets you examine machine-language programs such as those stored in the VIC-20 ROM. It features all standard mnemonics and uses standard addressing mode syntaxes. Each line displays the hexadecimal location of the instruction and the disassembled instruction itself. The actual hex data that is disassembled is not displayed. It does, however, display the absolute address of all branch instructions instead of the relative offset. One other handy feature lets you convert between hex and decimal numbers. The program doesn't provide output for the VIC-Printer, but you should be able to add that easily enough.

They also have a machine-language monitor program for the VIC-20. It displays the program counter and the byte pointed to by the program counter, along with the accumulator and the X, Y and status registers. The stack register is not displayed and cannot be directly accessed via the monitor. Function keys let you step forward and backward through memory or step through the displayed fields to change them as you wish.

Hitting the H key displays a 48-byte hexadecimal dump of an area of memory starting at the current program counter location. Typing Q will exit the monitor and return to Basic. Typing G will start program execution at the current program counter location. The program is called as a subroutine with an RTS instruction required to return to the monitor. This is slightly different from other 6502 monitors that normally use the break instruction to return to the monitor. Also, the program counter is used for all memory references, including modifying memory locations. You can't modify locations displayed by the memory dump function.

This monitor resides at the top of RAM memory, with separate versions available for different memory configurations. Because it is at the top of memory, you can't use it to develop machine-language programs that you would normally want at the top of memory. The three pages of documentation provided include information on several subroutines within the monitor that can be used by other programs or extensions to the existing monitor. You must follow the loading instructions exactly or the program won't load in the right location and won't run.

As the documentation states, this is a simple monitor but it provides enough features to be useful in working with machine-language programs. It's nowhere near as good as the VIC-Monitor cartridge from Commodore, but at $4.95 it may still be worthwhile for those just dabbling in machine language.

The other program from Transonic Laboratories that I tried was their Torture Chamber of Doctor X. This is a simple but challenging game with color graphics and sound. Separate skill levels make it suitable for both children and adults. The program is split into two parts—the first provides instructions and automatically loads the second. The game uses peek and poke commands and won't run with an 8K expander installed. Also, you must have a standard Atari joystick for game control—the program doesn't allow keyboard control.

Another program, called Sprintyper, was mentioned in Transonic's price sheets. This is supposed to be a game for improving your typing skills, and sounds pretty good from the description. All of the programs I tried were of good quality and nicely documented. For more information on these and other VIC-20 programs, you can write to Transonic Laboratories, 249 Norton St., Mankato, MN 56001. They also intend to include programs for the CBM 8032 some time in the future.

Misc

A recent press release from Commodore announced three new systems that were to be shown for the first time at the Hanover Fair in Germany during late April. The debut in the U.S. was to have been during the National Computer Conference in Houston during June. Exact prices were to have been announced in June with initial shipments scheduled for some time in September. Prices were hinted as being far less than similarly configured personal computers currently available with 64K to 128K of memory.

The first system is a full color, 40-column system with 128K bytes of RAM. The second is an 80-column system with attached video monitor, 128K of RAM and built-in dual floppy disk drives with 340K of storage capacity. Both of these systems are based on a new Commodore microprocessor, the 6509, and will be capable of accepting a Z-80 or 16-bit 8088 microprocessor. This will allow the new systems to use the large base of CP/M software currently available.

The top of the line system is an 80-column, 16-bit multiprocessor system with attached video monitor, 256K of RAM and built-in dual floppy disk drives with 680K of storage capacity. This system includes both the Commodore 6509 and an 8088 16-bit microprocessor.

Caveat

If you're playing around with machine-language programs on an 8032 system, be sure to stay away from hex location 7FFF at the top of RAM memory. Apparently this location is occasionally used with the checksum when you are saving a program to tape with the monitor. Also, the second cassette is not reliable since some of the second cassette variables in low RAM are also used for other functions in the 8016 and 8032.

Quirk

If you have a 2001 series PET and still have the Basic 3.0 ROMs installed, try typing this command and see what you get:

```
WAIT 6502,10
```

You should see MICROSOFT BASIC repeated ten times on the display. Newer Basic 4.0 systems do not have this little "feature."

Copy

A help disk is now available for the new edition of the Osborne/McGraw-Hill PET/CBM Guide. It contains a number of useful programs, including a new disk utility by Jim Butterfield to copy files from one disk controller to another. Copies of the disk are being provided by ATUG as well as other user's groups across the country. I can supply copies for the 8050 drive; you can get 4040 copies from Brent Anderson, 200 S. Century, Rantoul, IL 61866. Terms are the same as for all other ATUG disks: $5 if you supply the disk, mailer and return postage, or $10 if we take care of everything. If you are sending a disk please be sure to package it properly so it arrives undamaged.□

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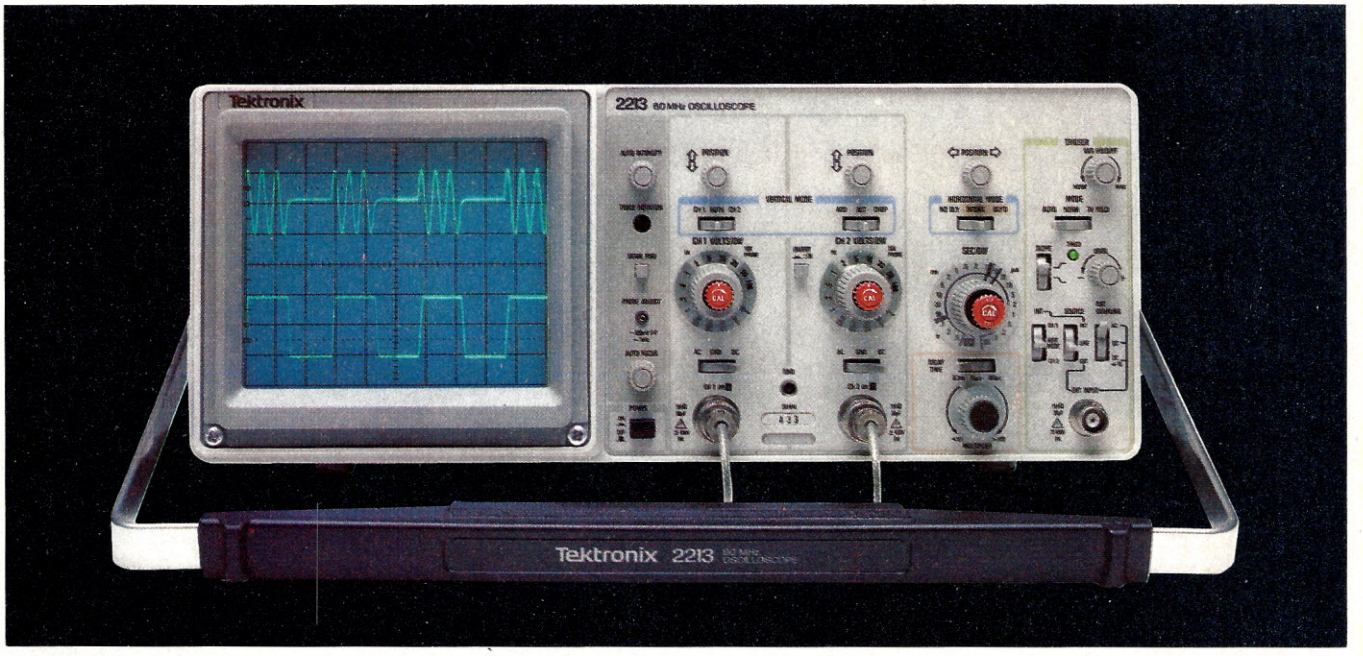

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By Frank J. Derfler

Bulletin Boards Continue to Hum

Make Inroads Against Big Info Utilities

I started this column two and one-half years ago to discuss electronic message systems and methods of dialing them up using a microcomputer as a communications device. Since that time we have wandered all over the landscape looking at information utilities, alternative telephone services, a lot of different hardware and a seemingly endless pile of software. This month, we will circle around and go back to where we started, back to electronic message systems, to see what the status of the phenomenon is now. But first, let's look back over the path we have travelled.

Let's begin by defining a few terms. Electronic message system (EMS) is a generic term for a microcomputer that contains a database that can be accessed by people (or machines) calling in over telephone lines. The database normally contains messages posted by individual users and addressed either to specific people or for the general interest of all users. The database may also contain programs to run or other features such as special-interest conferences and program exchanges.

The systems include an automatic answering modem which translates between the direct-current digital signals of the computer and the analog audio signals of the telephone system. The modem answers the phone when it rings and allows the system to operate without human attendance.

Aside from those broad statements, it is not easy to generalize about electronic message systems. Some are running on simple computers with 48K of RAM and no disk drives, while others are on minicomputers with 40 megabytes of hard-disk storage. Some are run by charitable individuals, others by major corporations. Some systems are run for the general interest of anyone who might call in, while others specialize in genealogy, medical in-

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.

Table. List of active electronic message systems (courtesy of Bill Blue).

```
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     *24 denotes 24-hour operation
      #1  denotes original system of that type
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     -so  sexually oriented messages
       !  new system or new number to existing system
       $  Supports VADIC 1200 baud operation
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ABBS Bowling Green, OH.......................(419) 352 4477
ABBS Byte Shop, Ft. Lauderdale, FL............(305) 486 2983
ABBS Byte Shop, Miami, FL.....................(305) 261 3639
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Businessmen

Q. Do you have difficulty operating your printer when connected to a time-sharing computer? Are files you're trying to download too large for your system buffer? Does your host computer lose data when you send files to it?

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Authors

Q. Does your line of work involve sending written material to others? Are you a program author who would like to send work in progress to a partner or client and know that it arrived intact? What would the ability to instantly send material or programs to anyone at any time be worth to you?

A. "The Professionals" provide the ideal way to send your articles, manuscripts, reports, programs and technical documents to another computer with phone line access. Now you can work WHEREVER you want, and be assured that your data is sent to its destination quickly and error-free. In fact, compared to the fastest mail services, "The Professionals" offer immediate delivery and will save you the purchase price in just a few uses.

Students

Q. Are you bothered by limited access to your school's existing terminals? Would you like to be able to do your school assignments at home at your own convenience?

A. "The Professionals" allow you to access virtually any dial-up school or college computer system over standard telephone lines. This means no more waiting in line for an available terminal or hassles with malfunctioning school equipment. You can even prepare term papers or reports while off-line and send the completed work to the school computer for final printing. Best of all, you can work from home at the times most convenient for you.

Time Share Users

Q. Are you tired of wasting time and money sending or receiving files with inadequate, poorly designed software? Do you find yourself manually performing the same lengthy log-in procedures over and over again? Would you like to automate these procedures for yourself and others?

A. "The Professionals" allow you to send files which have been prepared in advance. They may then be transferred at any time, as quickly as possible — even to several different systems. No time is wasted reviewing information while on line; data may be captured by your computer or printer (or both) to be evaluated later at your convenience. These features assure minimum on-line time and therefore minimum on-line cost.

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Q. Would you like to be able to take advantage of the information featured on local bulletin boards and information services such as The Source, CompuServe, Dow Jones, and others?

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Clubs

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formation, investments or subjects that are for adults only.

The Pioneers

Ward Christensen and Randy Suess are widely acknowledged as having started the first successful electronic message system in Chicago in early 1979. Their original goal was to exchange messages with members of their local computer club, in much the same way that they posted notes on a cork bulletin board. They called their system a computer bulletin board system or CBBS.

CBBS served as a generic term for a while, until Ward and Randy protected it with a copyright and directed that it should apply only to systems running with their software. The CBBS software is designed to be run on an S-100 bus system using Digital Research's CP/M operating system.

The popular Apple II computer was not far behind. Craig Vaughan and Bill Blue collaborated in California to develop the first successful Apple Bulletin Board System or ABBS. They later separated, with Bill developing the Peoples' Message System Software and Craig continuing on with significant improvements to the ABBS software.

Dennis Hayes, Glenn Sirkis and Dale Heatherington developed a multifunction modem device for S-100 and Apple II com-

Table continued.

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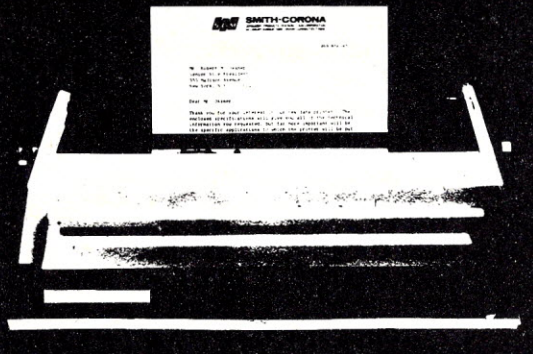

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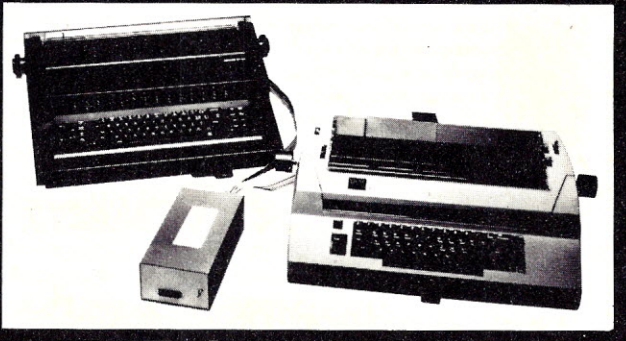

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puters called the D.C. Hayes Micromodem. Don Brown at Potomac Micro Magic, Inc., also made a significant contribution with the development of his high-quality PMMI modem board. (Mr. Brown died on December 15, 1981. His son is continuing the operation of the company.) These integrated modem devices functioned without a serial port and provided some very useful capabilities such as auto-answer and auto-dial.

Ward Christensen accepted the challenge of integrating these modem devices with the S-100 bus microcomputers running under CP/M, and wrote the widely-used Modem program which he placed in the public domain. This program has gone through at least seven major revisions. Modem introduced the Christensen protocol, which has become a *de facto* standard for the performance of error detection and retransmission during file transfer.

Other early smart terminal programs include Clink written by Larry Hughes, Telestar by Leonard Garcia and the ST80 series (continually updated) by Lance Micklus.

The popularity of microcomputer data communications was given a big boost by the aggressive marketing of the Cat modem by Novation. Cats were available under several manufacturers' labels, and provided reliable and simple operation at a reasonable price.

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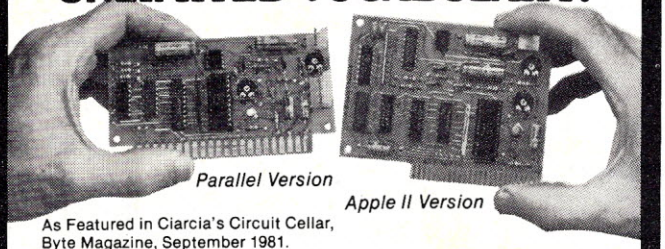

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The next significant advances came in the quality of the software. If the microcomputer data communications phenomenon was to grow, the software had to become easier to install and use. Programs such as Omniterm by David Lindbergh, ASCII Express by Bill Blue and Crosstalk by Les Freed began to fill this need.

Bill Abney's development and distribution of the Forum 80 software was another milestone. This network was one of the first to include the ability to exchange programs and it provided additional motivation for many people to try data communications.

Also, around the beginning of 1980, a guy named Derfler started writing a column explaining modems, programs and the paraphernalia of data communications in *Kilobaud Microcomputing*. I have been told that this column encouraged many people to "get on the air."

At about the mid-point of 1980 I started writing my book, *Microcomputer Data Communications Systems*, which was released at the end of 1981. I hope that it too will serve as a marker on the road to successful communications for many people.

The folks down at Hayes (now renamed Hayes Microcomputer Products) set another milestone when they released the Hayes Stack SmartModem. This device

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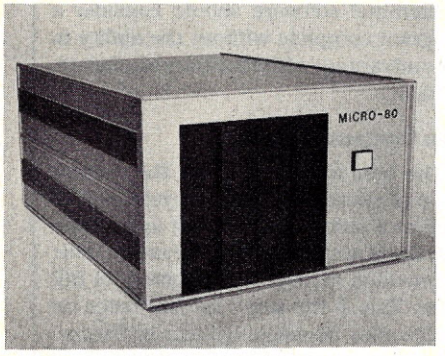

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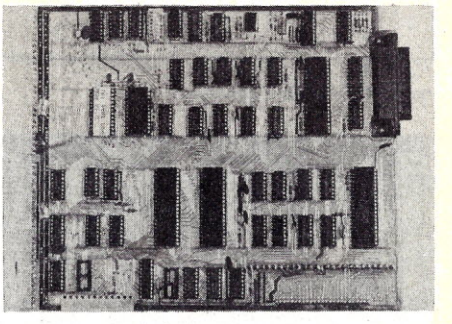

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gave any computer or terminal with a serial port the ability to automatically dial and answer the telephone line. No author of terminal software should consider a program complete without the ability to take advantage of the features of a Smartmodem.

The Current Situation

The best way to examine the current state of electronic message systems is to look at a comprehensive list (see table). The list of systems published in this table is provided through the courtesy of Bill Blue. This is the same list Bill keeps on his Peoples' Message System in Santee, CA. Because of publication lead time, I make no guarantees as to its accuracy, but at least it gives you a good idea of the kinds of systems available. Almost every microcomputer type is shown, and the trend toward special interest systems is apparent.

The systems that are active provide a unique cross-section of the microcomputer industry. Apples and TRS-80s predominate. Commodore and Atari seem under-represented, even though message system software for the PET has been available for a long time.

The growth of systems dedicated mainly to the exchange of CP/M software has been very fast. Many of those RCP/M systems are very sophisticated and pro-

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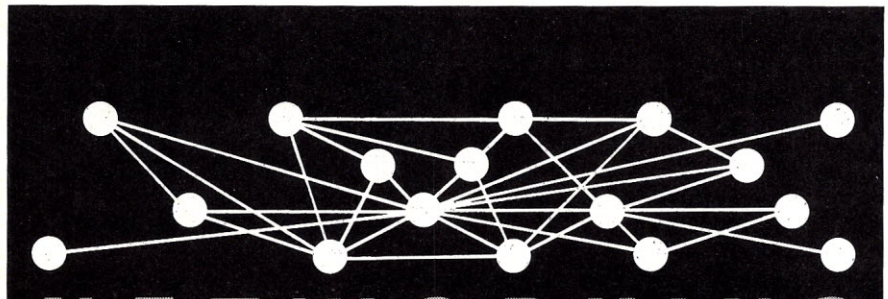

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vide a wealth of free software (most of it from the CP/M user's group). As this is being written I know of one bulletin board dedicated to the IBM PC (703-560-0979). By the time this is published I would bet that at least ten will be active.

Another trend in these systems is toward better organization of the material, so the user doesn't have to spend so much time going through long lists of messages. Special interest conferences allow users with shared interests to gather together in one corner of the database while still benefitting from the presence of the whole group. The concept of conferences allows better sharing of the resources while providing support for subgroups who might not be able to justify a dedicated system.

The software controlling these systems has continued to evolve in many ways. The system crashers who used to derive twisted pleasure from entering a system and disabling it have been foiled by some very clever procedures. Many of the systems provide such features as automatic recognition at sign-on, selective message scan and marking, and multiple user access.

The geographical spread of the systems is interesting to examine too. Certainly, California leads in the number and diversity of systems, but some high-quality message systems have been set up to serve various portions of the U.S. and Canada. The Europeans simply don't seem to

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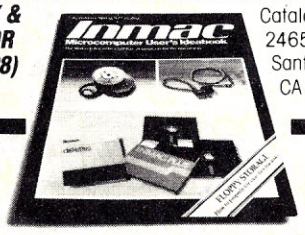

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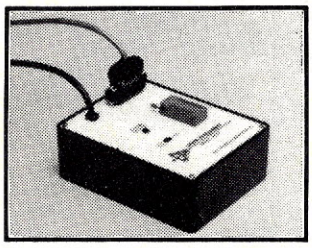

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feel the need to communicate through computers. Even accounting for the tariffs, more limited phone services and other technical factors, the number and activity of European systems is surprisingly low.

The Future?

A little over a year ago I predicted that the number of electronic message systems would decline as the information utilities (The Source and CompuServe) expanded their services and added special-interest message systems of their own. It appears that instead things stayed pretty level. The CP/M program exchange systems grew like a weed, others died off and the information utilities didn't gain as much ground as most of us thought they would.

I will be conservative and predict more of the same for the next 12 months. New systems supporting the IBM PC will flourish, the information utilities will make some inroads into specialized markets, but the total number of electronic message systems will stay about the same.

Electronic message systems represent a very creative and innovative way to become more involved in the two rapidly expanding technologies of computers and communications. If you haven't checked into one, you might be missing some good information or fun. Beg, borrow or buy a modem, pick a couple of systems from this list, and check in.□

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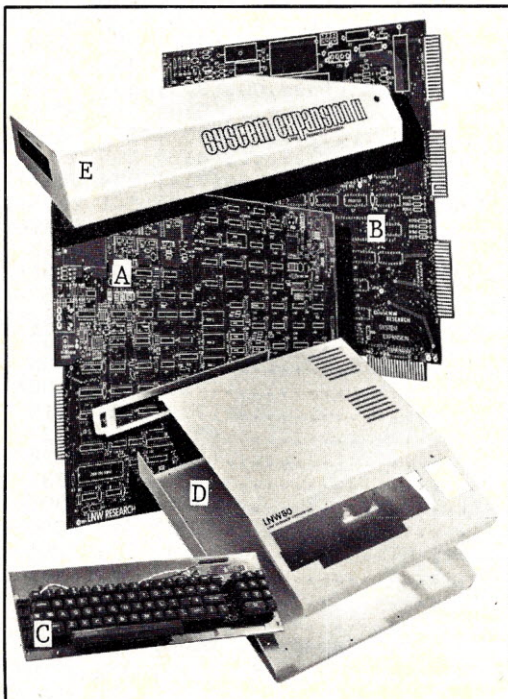

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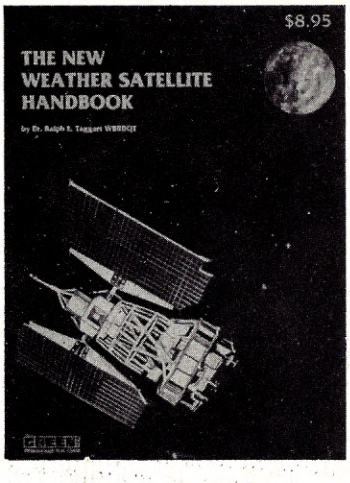

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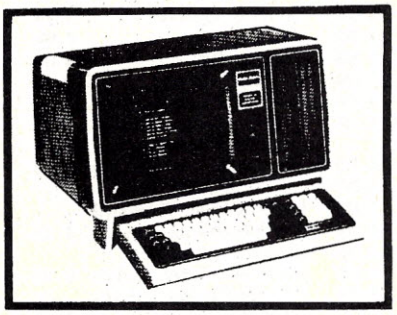

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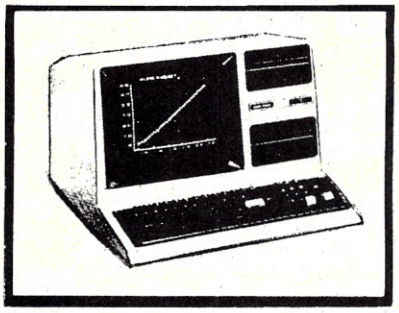

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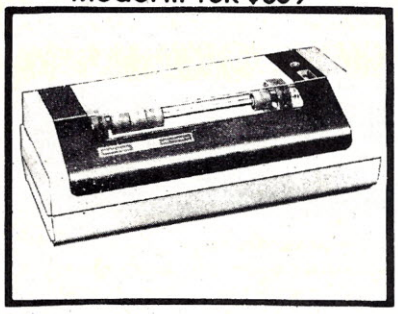

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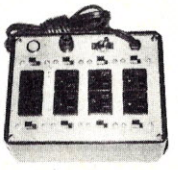

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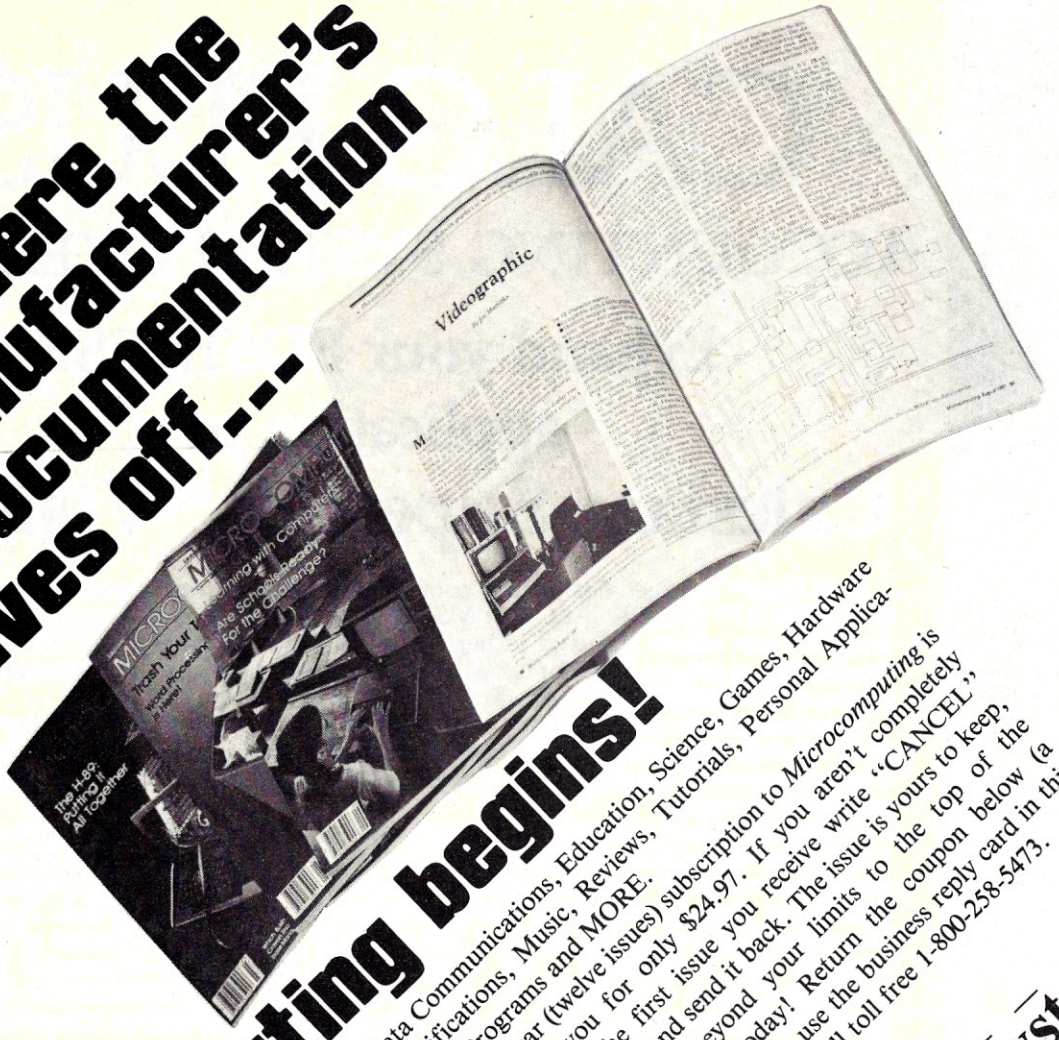

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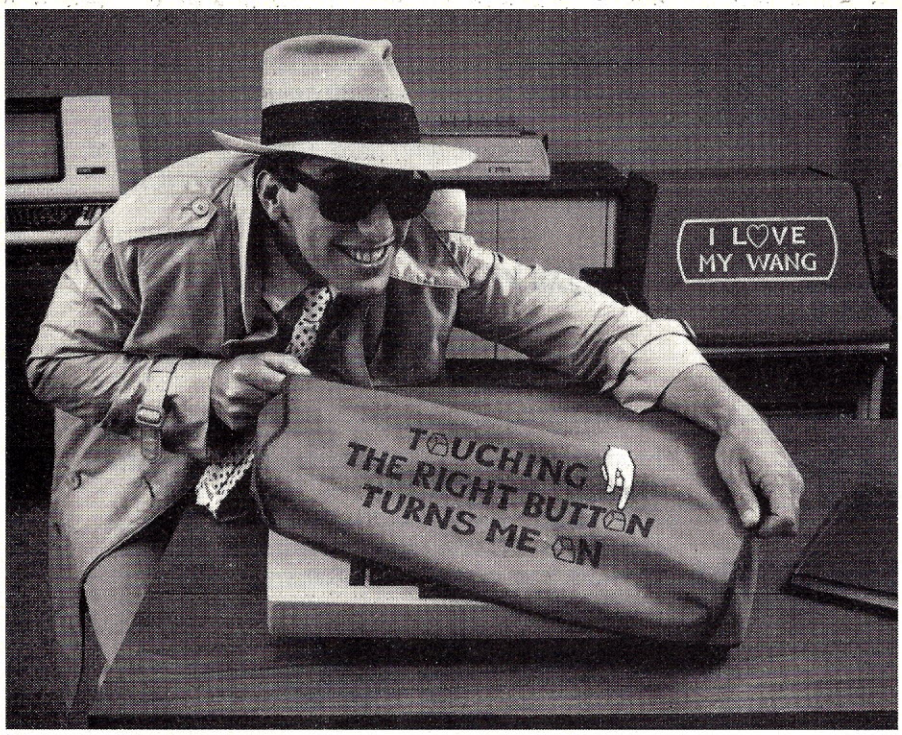

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structional modules handled by the project will be microcomputer-based. The project will set up procedures for soliciting, evaluating, use-testing, publicizing and disseminating instructional modules. SERAPHIM will also draw upon other National Science Foundation-sponsored projects in chemistry, chemical engineering, materials science, physics and mathematics for modules of interest to chemists. Modules will be reviewed and tested in classrooms and laboratories, and reviews by users will appear in the *Journal of Chemical Education*.

In addition to preparing and distributing modules, the project will attempt to improve the skills of authors of instructional computer programs through workshops for novice and advanced authors. Programming contests will also be held, with a cash prize for the best instructional program as judged by a group of chemical educators. The first workshop and programmer contest will take place at the Seventh Biennial Conference on Chemical Education, August 8–12.

Another major facet of Project SERAPHIM will be to explore the feasibility of using a nationwide timesharing service (such as The Source, Compuserve's MicroNet, Telenet, etc.) as a medium for exchange of ideas about instructional programming.

Project SERAPHIM has a special interest in producing materials that teach polymer chemistry, industrial chemistry, and environmental chemistry. We would like to hear from any industrial chemists or engineers who have personal microcomputers and are interested in writing programs that simulate on-the-job experiences.

Persons who want more information about the project, contact Dr. John W. Moore, Visiting Professor, Department of Chemistry, University of Wisconsin at Madison, Madison, WI 53706. 608-262-0215.

John W. Moore
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The Franklin YMCA is proposing to construct a cablecasting FM radio and television station for the purpose of training junior and senior high school students from our service area in broadcasting techniques. We will be using the local television cable system to carry our programming to the community.

Part of our plan of operation will depend on a computer to produce our program log. We plan to format our broadcast time on a weekly basis. By inventorying our records by title, year, type, artist, record length, ranking within the year and by inventory number, the deejay only needs to identify his program time and day and list the inventory numbers of the records chosen and the computer will list the music and announcements in the proper order, logging them in accordance with the announcement and record lengths, minute by minute. This procedure will allow us to choose the type of music by rejecting music which does not meet the format for the particular time slot. (In other words—no hard rock during the dinner hour.)

We have contacted several computer companies with the hope of obtaining a computer which would meet our needs through donation without much luck. It occurred to us that perhaps one of you may be upgrading to a larger computer and might be interested enough in our activity to donate your old unit to us.

I can be contacted at either the YMCA, Otter and West Park St., Franklin, PA 16323, or at my office (814-437-5711).

James F. Pankratz, Jr.
Disc Jockey Club Adviser
Franklin, PA

Fixes for Apple DOS 3.2 and 3.3

The Renumber utility program supplied with Apple DOS 3.2 and 3.3 has an insidious bug—after you use Renumber, your program may still appear to run perfectly, so you may not even notice that your program's operations have been altered! Renumber will correctly change all line number references to agree with the new line numbers. Unfortunately, Renumber may also alter any number in an arithmetic expression which (a) follows an asterisk (the multiply operator), and (b) has the same value as a pre-Renumber line number.

I obtained the corrections for the DOS 3.2 version from the Apple Hotline in May of 1980. I just discovered that the problem still exists in the DOS 3.3 version, and I am still seeing letters in various magazines from perplexed Apple users.

The fixes for the DOS 3.2 and DOS 3.3 versions of the program are similar—they involve swapping two data values in the program as shown in Table 1.

To permanently correct the Renumber program, you must

- load Renumber
- do the two pokes for your version of DOS
- save Renumber

All Apple owners should take note of these fixes. Even if you don't use Renumber, you'll be able to help out the next guy, who may not have read about this problem. For future reference, Apple dealers have a loose-leaf notebook which answers commonly-asked questions (including "What's wrong with Renumber?"); you just have to know to ask!

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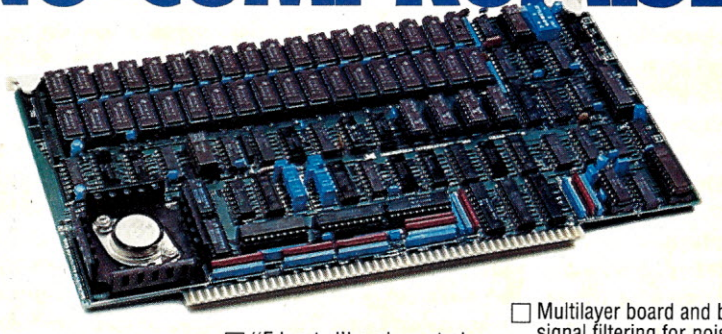

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Osborne— Behind Guerrilla Lines

This free-lance journalist reported on the Afghan rebels' resistance to the Soviet-backed regime in their country and filed his stories back to the U.S. using an Osborne computer.

By David Kline

Kunar Province, Afghanistan—The incoming mortar round whistled dully through the night sky, slamming with a loud crack into the side of the hill. Desperately looking around for cover, a dozen Islamic guerrillas in turbans fired their rifles and machine guns ineffectively at the pro-Russian militia position on the ridgeline above. Then another mortar round crashed into the trees 50 yards away, temporarily drowning out the staccato sounds of automatic rifle fire all around us.

Me, I lay flat on my back, trying to calculate the odds of the mortar crew above us lobbing one directly into my lap. It occurred to me that I wasn't being paid nearly enough for this assignment.

Seeing as how I had no other option but to at least try to act like a reporter, I pulled out my notebook and started to record my observations of the battle. I also began making plans for how I was going to file the story. I faced a three day walk over the mountains before I could get back to civilization—the dusty little frontier town of Peshawar, Pakistan, just 20 miles from the legendary Khyber Pass on the Afghan-Pakistan border. But even once I arrived, I still didn't know if I'd be able to file. For I intended to employ equipment never before used from this part of the world: a portable computer and telephone modem.

Oh well, first things first, I told myself. And the first thing I had to do that night was to find a rock to crawl under.

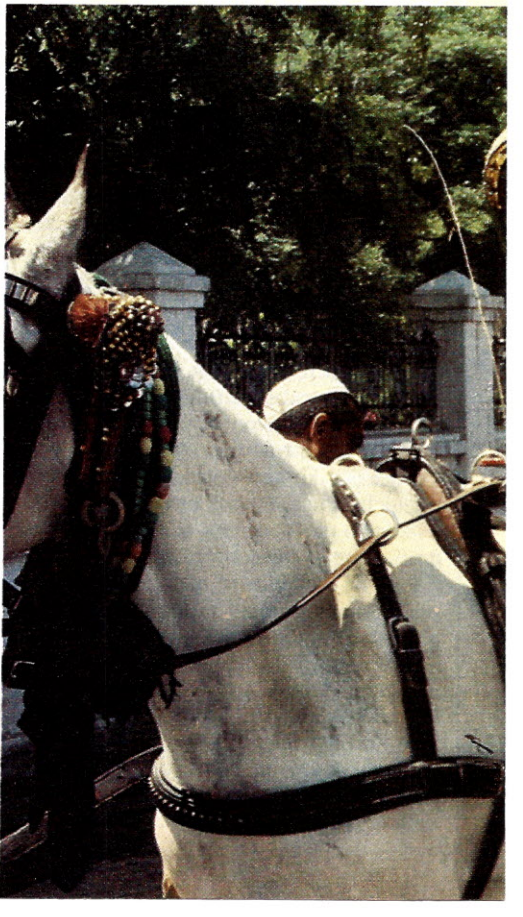
******

The experiment, for that's what it was, first took shape in late 1981. I had already decided to purchase a portable Osborne computer for word-processing, mail list and business applications in my free-lance writing agency. Then, when I was asked by CBS News, the *Chicago Sun-Times* and the *Los Angeles Times* to go back on assignment to Afghanistan (it would be my fourth trip in three years), an idea began bubbling in my head. Could I take the Osborne with me to the war zone, or at least close to it, and use the machine to both write and file my stories?

The advantages of using a computer as a reporter's tool in a situation like this would be significant. First and foremost, any articles I would write using a word-processing computer—with its quick and easy ability to edit and re-edit copy—would naturally be superior to what I could either write longhand or what I could hack out on a clackety manual typewriter. But also, if I could use a telephone modem or some other transmittal system to get my copy back to the newspapers, I could avoid the costly and often unreliable public telex offices in Pakistan.

Ordinarily, free-lance journalists like myself not based in a telex-equipped overseas office must go to a public telex office and present handwritten or typewritten copy to an often-bored and always insufferable bureaucrat-of-an-operator. He may or may not send your message that day, may or may not send it as written, and may or may not send it at all if it happens to offend his government (most telephone and telex systems outside the United States are government-owned and operated).

The implications of the experi-



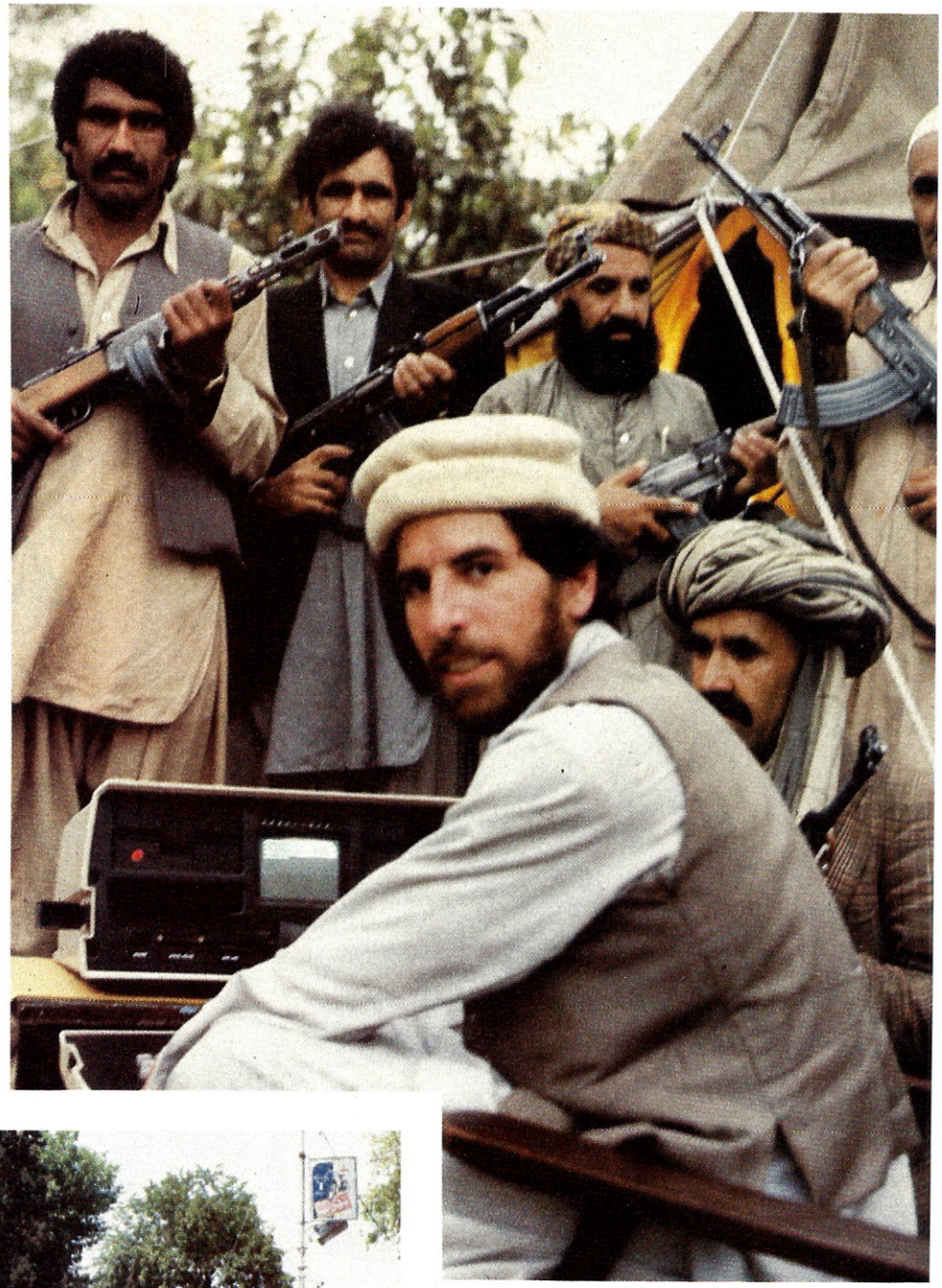
David Kline is director of Impact Features (2329 N. Sawyer Ave., Chicago, IL 60647), an agency for free-lance journalists. He reported from behind Afghanistan's rebel lines—his fourth trip in three years—on assignment for CBS-TV, the Los Angeles Times *and the* Chicago Sun-Times.

ment, however, went far beyond the immediate practical task of reporting on the Afghan war. There are currently more than 100,000 full-time professional journalists in the United States, with an additional 2 to 3 million people who consider themselves part-time writers. While staff journalists at many of the larger daily newspapers do use office-based CRTs to write their stories, the use of portable intelligent terminals or computers in on-location reporting is not at all common. And as for free-lance writers and journalists—that majority of our profession who don't have access to large office-based computer systems—the potential of computer technology as a professional writing tool is only now being examined with any seriousness.

The point, then, was simple: If I could successfully use a computer to write and file articles from the Afghan war zone—with all the inherent problems posed by using this technology in a third world country 12,000 miles from the nearest Computerland dealer—then presumably anyone could use the same technology from Podunk, Illinois, or anywhere else in the world.

From the start, the project faced a number of questions that needed answering:

- Was an Osborne durable enough to stand up to the punishments of a



On-location reporting from behind guerrilla lines is possible with the Osborne. David Kline (foreground) and Afghanistan independence fighters huddle around the Osborne at a guerrilla encampment near the Khyber Pass. (Photo by Impact Features)

David Kline and the Osborne computer survived a 12,000-plus-mile journey by plane, bus, car, horse, camel, foot and even by horse-drawn rickshaw to report on the Afghan rebels' resistance to the Soviet-backed regime in their country. The author is about to ride over to a friend's house in Peshawar to transmit an article back to the States. (Photo by Impact Features)

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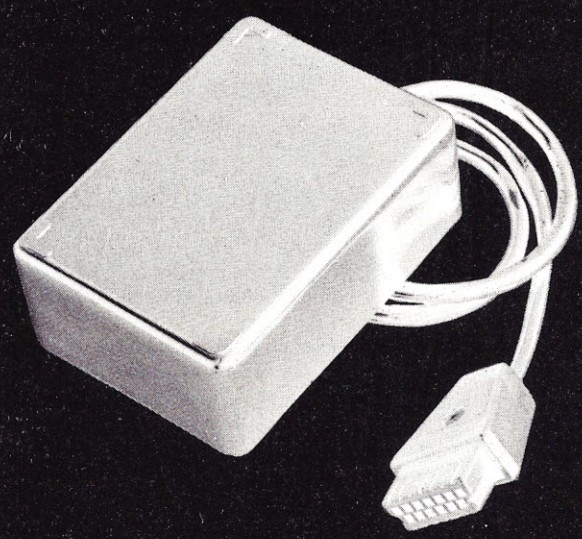

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12,000-mile journey by plane, bus, car, horse, camel and foot? Would it operate in the hot, dusty and dirty Asian environment?

- How does one get the Osborne to operate on Asian electrical currents, and what other power modifications would be needed for the modem and any other peripherals?
- Will a modem work from halfway around the world, and if so, what type of modem and baud rate should be used? What communications software should be used?

These were merely the main hurdles that needed to be crossed, of course. There were literally dozens of other questions that needed answers before I could leave for Afghanistan. These ran the gamut from finding out whether I needed a U.S. Commerce Department export license to take a microprocessor out of the country (no); to whether Pakistan's military martial-law government allowed the transmission of data over phone lines (yes or no, depending upon who you talked to); to how I was going to explain the concept of a personal business computer to a Pakistani airport security officer whose natural inclination after examining the Osborne would be to associate me with the CIA.

Luckily, this last question never came up—my description of the machine as a "Hollywood typewriter" was usually glumly accepted. But since I had no desire to spend a few weeks in a Pakistani jail, I brought along a lot of magazine advertisements to demonstrate the wide use of computers among everyday consumers.

I won't go into all the details of how each problem was solved, each question answered, but suffice to say that I called literally hundreds of experts in the computer and communications field. I even placed questions on computer bulletin-boards, and in at least one instance, solved one problem that way.

Among those who helped the most, Mr. Stan Sharman and the entire staff of the Computerland store in Niles, Illinois, were instrumental in determining the various modifications I would need to make in order to use the Osborne and modem in Pakistan. Actually, it was rather simple in the end, and I learned to switch the Osborne internally from 115 to 200 V ac myself. But in the beginning, we didn't know what would be required.

Next, Mr. Wayne Holder of Oasis Systems in San Diego generously put

There were literally dozens of other questions that needed answers before I could leave for Afghanistan.

together a pre-release copy of his superb spelling-checker software program, The Word, especially condensed and modified for the Osborne's mini-floppy drives. The Word, incidentally, is superior to any other spelling software I have seen, and for only $75 is only one-half to one-third the price of its competition. As a journalist, I valued its word-count capability far more than its spelling correction programs, because when an editor says he wants 900 words, he really doesn't want 905.

In addition, the folks at Electronic Specialists, Inc., in Natick, MA, were extremely helpful in rush-modifying one of their excellent Kleen Line power filters and spike suppressors. Without this device, Central Asia's erratic currents would have reduced my Osborne to just one more charred and smoking casualty of war.

But most important of all to the project was Mr. Marty Cawthorn, of the Cawthorn Scientific Group in Dearborn, MI. The firm specializes in computers and computer-communications, as well as custom software development. Marty put in literally dozens of hours trying to answer questions and solve problems as they came up, even when I was in Asia. He also acted as my relay to the various newspapers I was working for. Since these did not have error-checking ability in their computer communications programs, the plan was that Marty would first receive my articles via the Modem 7 error-checking communications program, then retransmit them the short distances to the newspapers involved.

On the Road

By March 21, I was ready to leave. Armed with my Osborne 1, a U.S.

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The first stop on my journey was Paris, where I had an assignment to interview exiled Iranian president Abolhassan Bani-Sadr. The interview would provide me with my first chance to use the computer in a foreign environment, operating at 220 V ac, as well as the first test of the modem in transmitting clearly an article over phone lines at great distances.

On the morning of March 23, I arrived for the interview at Bani-Sadr's heavily-guarded apartment in the Parisian suburb of Cachan, and by 2:00 PM I was back at my hotel near the Place D'Opera in the center of the city. For the next five hours, I wrote and rewrote my article, enjoying the ease of editing which WordStar's editing functions allow. By 7:00 PM, I was ready to call Marty and transmit the piece to him for relay to several newspapers.

I hesitated. Indeed, I was so nervous I had to go out for a walk. What if the modem didn't work? The French phones are shaped slightly different than ours—square handsets rather than round—so what if the skewed fit doesn't generate a strong enough signal through the modem? Or what if the computer and modem do work, but the French telephone operator calls the Duexieme Bureau to arrest me for being a spy? As you can see, I was somewhat paranoid about what lay ahead, but I went back to my room, braced myself, and placed the call.

As soon as Marty answered, I set my modem to originate; he set his to answer. When I heard his carrier tone, I slammed my receiver down into the modem and punched out the command for sending a file: S B: Banisadr.Int.

Then I hit the return key and watched the machine go to work:

"File Open, size 78 Sectors," declared my computer screen. Nonchalantly, it added that it was "Awaiting Initial NAK."

No response from Marty's computer. After a second, still no response, and I was sweating. Meanwhile, the

I had what I came for...
now it was time
to start filing my reports....

We didn't know for sure
that the military authorities
wouldn't have people
listening in
on all overseas calls.

screen kept blandly repeating that it was "Awaiting Initial NAK," as if I didn't know.

Finally, I heard those lovely grating sounds of the Osborne disk drives in action—something like a flatulent woodpecker, actually—and I knew the acknowledgement was received. The damn thing was working! First it sent Sector #1, then Sector #2 and on and on it kept on going!

Then I noticed something amiss at Sector #48:

"H RCD," smirked my Osborne. "Not ACK."

"Not ACK?!" I shouted back. Before I could really work myself into a frenzy, however, the problem resolved itself, whatever it was. Probably just a spike of noise in the overseas phone call.

"Send Sector #49," the Osborne began again, this time (or so it seemed to me) in a tone of disapproval over my obvious emotional instability. And so it went, all the way up to "Send Sector #78." Then came, finally, "All Transfers Completed!"

OK, so I successfully computed from Paris, a city, after all, that is very much at the center of our modern technological world. The real challenge lay ahead. It still remained to be seen whether I'd be able to use a computer as a reporter's tool from the legendary Land of the Khyber, where life has hardly changed at all in the 25 centuries since Alexander the Great's conquering spearmen first met and fought the fierce Afghan tribes in battle.

Afghan Trek

After two weeks behind guerrilla lines, I was ready to return to base. It wasn't just the physical stresses of the journey, nor was it the debilitat-

ing effects of the various creatures who had decided to make my stomach their home. Simply put, I had what I came for—a detailed analysis of the state of the Afghan war after three full winters of Russian occupation, as well as interviews and photos of all surviving Soviet prisoners held by the rebels—and now it was time to start filing my reports.

By April 15, I was back in Peshawar, typing away at my Osborne in Dean's Hotel, the favorite haunt of Western journalists. First, I decided, I'd type up a detailed outline of my observations, suggest a breakdown and order to my articles, and file that with my editor at the *Chicago Sun-Times*. After looking at my material, he'd tell me which piece to file first, what length in words, etc.

Of course, everything depended on whether I could even use the modem successfully from Peshawar. No one had ever tried it before, and there were some significant hurdles to be overcome.

The telephone call itself, for example, would have to travel 1000 miles by microwave from Peshawar to Karachi, then 6000 miles by satellite from Karachi to London, and finally another 5000 miles via undersea cable to New York and then Dearborn, MI. There, Marty Cawthorn would try to catch my scattered signals out of the ether and make some sense out of them. But at that distance, with at least a 500 millisecond delay in transmission, the chance that the distortion would be strong enough to prevent reliable transmission was great. Indeed, it was very hard to hear someone on the other end of the phone at that distance.

Then there was the possibility—nay, the likelihood—that a Pakistani telephone operator listening in on the call would cut us off at the first hint of beeping rather than talking. We could reduce that risk by having Marty call me and thus go through an American operator rather than the other way around, but still we didn't know for sure that the military authorities wouldn't have people listening in on all overseas calls.

And finally, there was the possibility of the power going out in my hotel room, what with my Osborne and modem running off one outlet. The watt usage was certainly not great, but who knew the limits of a hotel electrical system in a city that only recently was electrified?

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APPROX. # DISKETTES OWNED ____ (32) BRAND PREFERENCE ____ (33)

AMOUNT OF MEMORY (Circle) 8K (35) 16K (36) 24K (37) 32K (38) 48K (39) 64K (40) 128K (41)

DISKETTES PURCHASED/YEAR ____ (43) LANGUAGES YOU PROGRAM WITH OR USE (Circle)

BASIC (44) FORTRAN (45) COBOL (46) MACHINE (47) ASSEMBLER (48) MONITORS (49) FORTH (50)

ALGOL (51) PASCAL (52) C (53) ADA (54) APL (55) LISP (56) CAI (57)

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On April 16, at 6:00 PM, I placed a call to Marty, asking him to call me back for transmission. While waiting for the return call, I set up my modem and got a shock: the phone simply wouldn't fit in the modem's handset because it was a good inch longer than the standard size. I could have kicked myself for assuming anything in this part of the world, and for not checking to make sure that the hotel room phone would work.

So when Marty called, I gave him another number to call in an hour, the number of a friend with a phone that would work. Then, folding up my Osborne and throwing the modem, power filter and attachments into a camera bag, I grabbed a horse-drawn rickshaw and raced over to my friend's house to wait for Marty's return call.

At 8:00 PM sharp, Marty called again. I set the modem on originate, and when I heard his answer carrier tone, I placed the phone in the handset and punched out the code for sending a file.

"File Open, Size 68 Sectors," flashed the screen, followed by, "Awaiting Initial NAK."

One second, two seconds, three...nothing was happening! I picked up the phone, as did Marty, and asked what the problem was. He didn't know. Try again, he suggested.

Once again: "Awaiting Initial NAK." And once again, no acknowledgement from Marty's computer! Over the next ten minutes, we tried just about everything we could think of, variously setting my modem on originate, answer, half-duplex or punching out alternate codes for sending a file on Modem 7. Nothing worked.

Then Marty had an idea: "Start counting backwards from 10," he urged. "I want to try something." As I began counting, he started talking at the same time, but I couldn't hear what he was saying.

"Just as I thought," Marty announced. "Somehow, I think we've got a one-way circuit here. The signals can only go in one direction at a time."

The significance of this fact escaped my technically unsophisticated mind, until Marty clued me in. It seems that our modem handshaking program required simultaneous two-way sound transmission. Thus the one-way circuit was preventing file transfer.

As it turned out,
I had an unfair advantage:
the Osborne 1 computer
and the modem....

The era of the portable computer
as a reporter's tool
is upon us.

"Okay, just send your file using your Microlink program, without error-checking," Marty advised. But I was so flustered by the failure, I forgot the code for loading a file into the system and then transmitting it. I told Marty to call me the next day.

When he did call the next morning I was prepared for the Microlink file transfer, though I was also concerned about the text being garbled since we weren't going to use the Modem 7's error-checking functions. Marty, too, was prepared: he had decided to tape-record my signal, then amplify it for clarity before feeding it into his computer for deciphering.

"Okay, Marty," I asked, "ready to go?"

"Give me a second," he replied, "while I make sure the recorder's set up properly."

While waiting, I gazed out the window at the fresh, crisp morning sky over Peshawar. It's going to be a beautiful day, I thought; not a cloud in the sky.

That's it! Not a cloud in the sky!

"Marty, wait a minute!" I shouted into the phone. "Let's try it once more using Modem 7. We had a big thunderstorm last night. Maybe the atmospheric disturbance blocked our transmission."

Indeed, it turned out that it had. With a circuit that morning that allowed simultaneous two-way sound transmission, our two computers were soon talking and humming contentedly to each other across 12,000 miles of mountain, desert, ocean and outer space. With only a half-dozen or so sectors needing retransmission due to garbling, my 68 sector file was successfully transferred and relayed to the *Chicago Sun-Times*. Later that day, I received a telex from the editor that since no one else could beat me on these stories, I should wait until my return to Chicago to actually file the finished articles, which would then be run in a four-part series. That way, we'd also be able to develop my film and use photos with the series.

So, I thought proudly, the whole crazy experiment worked. Still, the victory was a somewhat hollow one. Though I knew a computer-plus-modem combination would work, I hadn't had the opportunity to actually test the whole system out in competition with the typewriter-plus-telex system more commonly used by reporters. As they say in war, my Osborne had not yet been tested in the heat of the battle.

Three days later, my computer received its baptism of fire. While routinely visiting my contacts in the Afghan rebel leadership, I had stumbled across an amazing piece of news. The Afghan rebels' most important Soviet prisoner, a civilian specialist by the name of Mikhail Evgeny Okrimyuk, had apparently been executed by his guerrilla captors.

Why the rebels shot this man I didn't know. What I did know was that this was a major piece of news and that I was the only one that had it. But in order to get confirmation, I needed help. I called my friend Alain Faudeaux, the permanent correspondent in Pakistan for the prestigious Agence France Presse (AFP), who was based 100 miles south of Peshawar in the city of Islamabad. In exchange for giving him the story and an equal chance to beat me in filing it, Alain would come up to Peshawar and give me those contacts of his that I needed to confirm the execution of Okrimyuk.

By 2:30 in the afternoon of April 19, Alain and I had all we needed to run with the story. Taking the room next to mine at Dean's Hotel, he began furiously hacking out his story on an ancient manual. After completing the piece, he planned to take it to the public telex office for transmission to AFP's main office in Paris. Had Alain been working from his home base in Islamabad, of course, he would have had access to his own telex machine. But for all intents and purposes, we were both away from our home base, both in possession of a great story, and both working like mad to beat the other to print.

As it turned out, I had an unfair advantage: the Osborne 1 computer and the modem. With glitteringly beauti-

ful copy stored on floppy, I finished my piece by 4:30 PM, while Alain was still working on his rough second draft. One problem for him, of course, was that he had to write the final text in English—the only language the telex operator could read. If he was back at his office (or if he was using a computer like me) he could have written the piece in his native French and transmitted it to Paris as is.

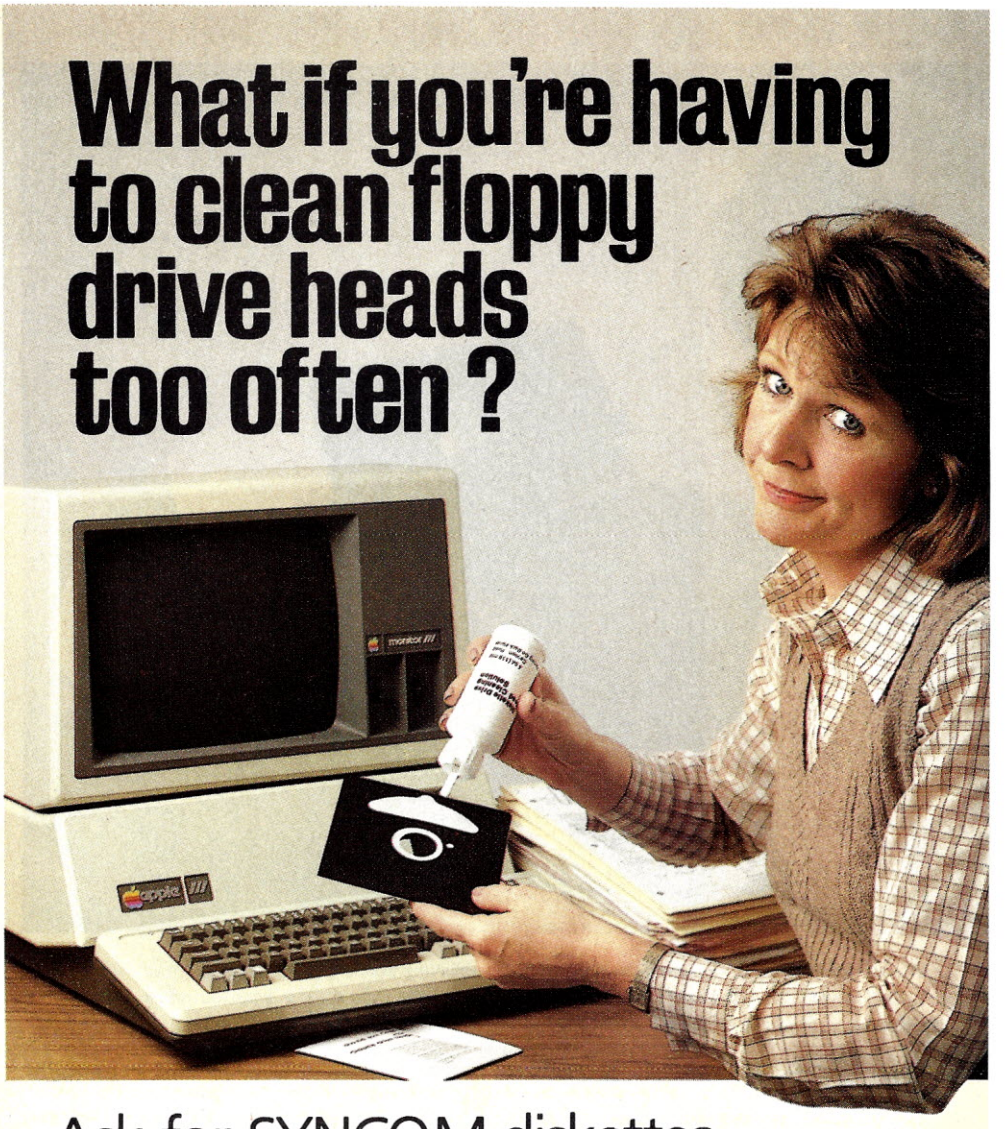
So, bidding adieu to Alain, I packed up my Osborne and peripherals, and—leaving Alain muttering his obscure French profanities—I hopped a rickshaw to my friend's house. There, I placed a call to Marty, asked him to call me back, and when he did, transmitted the text of my article in one try. Marty immediately relayed it to the *Sun-Times*, which received it at about 7:30 PM my time on April 19, or about 9:30 AM April 19 Chicago time. My article, headlined "Afghans Claim No. 1 Soviet Prisoner Killed," was run Page 2 in the afternoon edition of the *Sun-Times* that very day.

Great buckets of camel puckie! I had beat Agence France Presse to print by five hours!

What Next?

It would be wrong, of course, to imply that all journalists should immediately dump their portable typewriters and telexes and switch to computerized reporting. There are still many problems to be overcome, not the least of which is the fact that the worldwide telex system is already in place and hooked squarely into the very guts of the international news gathering community.

Other problems include the lack today of any support and service system in remote world locations for the still fairly fragile computers, and the relatively costly phone calls needed to use a modem as against a privately-owned telex (public telexes, however, are still more expensive than international telephone calls). Nevertheless, it can surely be said that the era of the portable computer as a reporter's tool is upon us. In the next few years, with the widespread substitution of flat panel displays for those cumbersome CRT screens, full-capability computers like the Osborne will no longer weigh 24 pounds, but rather will be packaged briefcase size, with the essential typewriter-style keyboards, at between



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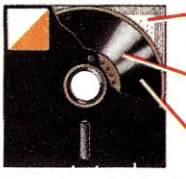

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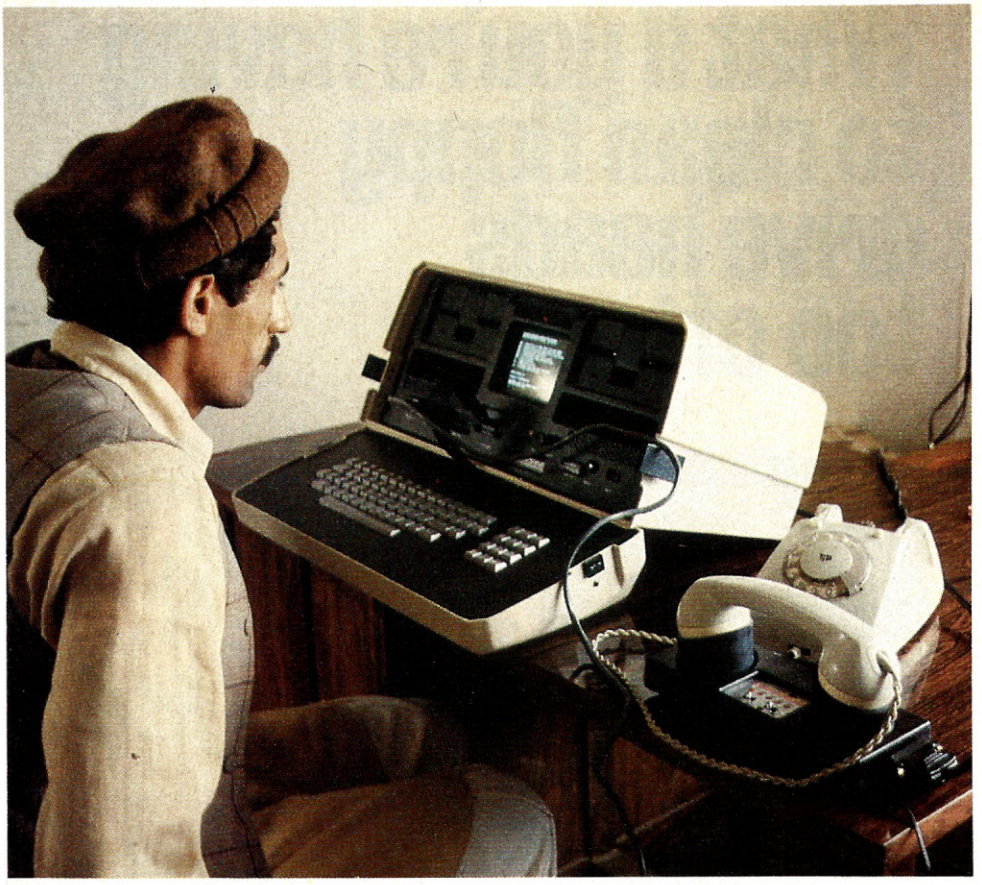

Momentarily trading in his arms for the latest war-reporting weapon, this Afghan guerrilla assisted journalist David Kline in transmitting his stories back to the U.S. from a guerrilla office located near Peshawar. (Photo by David Kline/Impact Features)

five to ten pounds. If a reporter would be satisfied with simply an intelligent terminal with built-in text-editing firmware rather than floppy disk drives, the weight of the machine would be reduced even further.

And with the low power generating CMOS circuitry now being widely introduced, these computers will probably come supplied with really lightweight battery packs enabling a journalist to operate even in a remote Asian battlefield, far from any power source, if that's what he's crazy enough to want to do. In other words, we're talking about true portability for computers—the ability to use a computer in any environment under any conceivable conditions.

As for communications, no longer must we wait for underdeveloped third world countries to develop cumbersome and costly ground telephone systems. The rapid proliferation of satellite-based commercial telephone systems promises to bring reliable phone service to even the most remote corners of the earth within just a few years.

All of this is not fantasy; the technology exists and is in use right now. The task is simply to make the technology more widely available to and accepted by journalists. And in this, I'm afraid, the industry has been sadly remiss. Rarely do I even see advertisements for portable computers in our professional journals and magazines. The attitude of the marketing managers in the industry seems to be to treat all potential buyers of serious small computers as simply one big lump of undifferentiated "small businessmen."

That the commercial market may, in fact, be divided into distinct sectors—with the journalism sector, for example, having its own special needs and requirements that must be met by the industry—well, this notion does not seem to have intruded into the heady boardrooms of Silicon Valley.

Most reporters I know are keenly interested in the potential of portable computers and terminals, but suspect that somehow this technology may not be suitable for their work because no one in the industry has specifically shown them that it is. Of the major news organizations, only CBS television, as far as I am aware, has been approached about assigning portable computers to field reporters—approached by the aggressive Osborne Computer Corp., incidentally.

What about the hundreds of thousands of telex machines currently in place around the world? No one is talking about dumping them into the trash heap of history. Some portable microcomputers, like the 20 lb. Otrona, are already capable of communicating at baud rates compatible with 50 or 110 bps telexes. It's a relatively simple matter to install interface ports on new telex models, or for a manufacturer to develop a cheap "black box" device to convert a micro's eight-level ASCII code to a telex's five-level baudot, thus offering any journalist in the world the option of transmitting computer-generated copy either by phone or telex, according to his or her desire.

Indeed, the only hold-up in creating a worldwide micro-telex network combining the best of both systems may be the fact that in most countries of the world, communications systems are under government control. Even that problem can be solved in time, however, if appropriate agreements allowing free access to such networks by news organizations are arrived at.

A final word should be said about the Osborne computer itself. Frankly, when I began the journey, I had serious doubts about its durability. The plastic case enclosing the machine is rather flimsy and highly susceptible to dents. But I'm happy to report that all the damage inflicted by arrogant customs officers, airline police, vengeful Paris bellhops and opium-fogged Pakistani cabbies was entirely cosmetic. I even kicked over the machine accidentally on two occasions, and yet it still works fine.

What can we look for in the more distant future—say, ten years from now? Voice-activated computers capable of automatically transcribing hours of interviews with either a Georgia farmer or a Boston bank president? Battery-powered portable computers weighing five pounds or less capable of transmitting articles over short-wave bands from remote world hot-spots to a waiting host in a nearby city for relay to newspaper offices continents away? As a journalist, I look to the computer technology field with great hope and expectation.

Who knows, we may even get a portable computer capable of stopping a Russian bullet! ■

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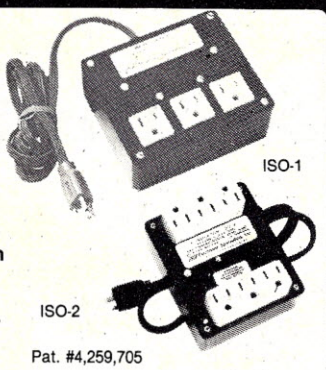

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A Printer Solution For the H89

Here's an interface package that lets you add a Centronics or Epson printer to your Heath for correspondence-quality print at a low cost.

By J.C. Hassall

Soon after my company began to use its H89 computer system, it became clear that our H14 printer was inadequate. It was fine for printouts of engineering calculations, program listings and in-house documents, but was unsatisfactory for customer documents. Documentation, letters manuscripts and other material to be sent out must look professional.

The problem with the H14 is its 5 by 7 dot matrix. Each character must fit in a box five dots wide by seven dots high. The dots are spaced relatively far apart, and lowercase descenders are impossible. Any lowercase letter requiring a tail is forced upward in the printed line, so the letters look peculiar and are frequently difficult to read. The resulting print font is totally unsatisfactory for general correspondence.

The easiest solution would have been to buy one of Heath's formed-character printers, either the WH44 (Diablo 1640) or the WH54 (Diablo 630). But the cost was prohibitive—$2200 or more.

Enter Centronics

Enter the Centronics 737 line. It offers high-quality dot matrix print at a reasonable price. But we're not out of the woods yet. The 737-1 (the least expensive and most widely available of the 737 model line) requires a Centronics parallel interface (a de facto industry standard), which the H-89 does not support, and a software driver.

Fortunately, the FBE Research Company, Inc. (PO Box 68234, Seattle, WA 98168), H89CTI Series Interface package ($64.95 for the described package) is designed expressly to interface either the Centronics model 737 or the Epson model MX-80 printers (the interfaces differ slightly) to the H-89/Z-89 with little or no modification of the computer. The interface is configured to operate on the right-side internal H-89 bus, with no modification required. If you want to install it on the left-side bus, the package comes with a cable assembly and explicit directions to do so (see Photo 1).

The interface is user-friendly and is accessed as easily as the LP.DVD device driver for the H14 line printer. Also, the device driver allows dynamic control of the various printer features under software control. The CT: device driver included on the disk provides full access to all of the printer's features:

- underscoring
- elongated, proportional, condensed or standard print fonts
- subscripting and superscripting
- backspace
- half or full, forward or reverse line feeds

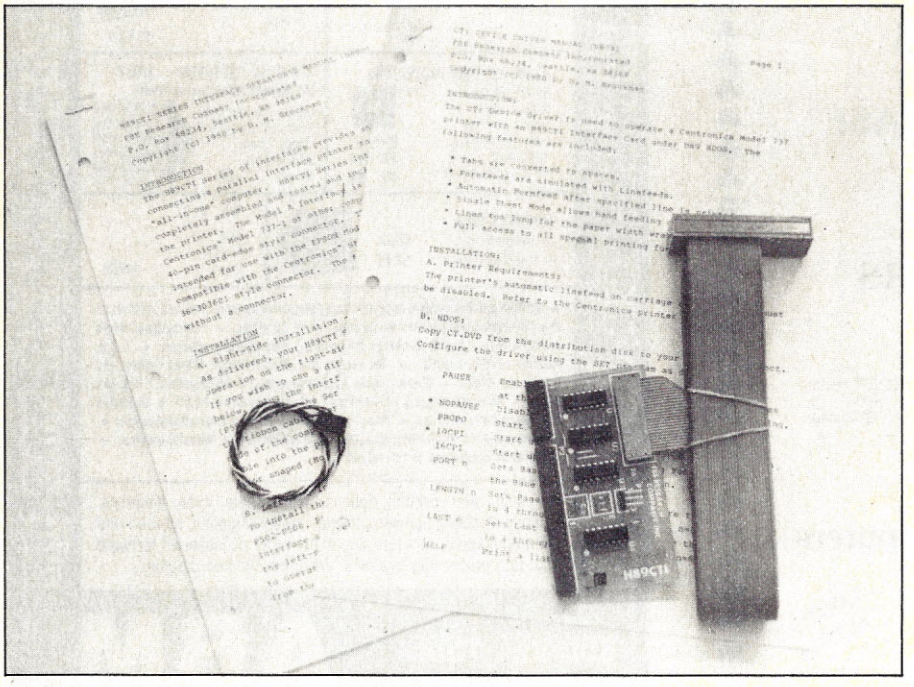

Photo 1. This photo shows the hardware and documentation portion of the interface package. Not shown is the 5¼-inch disk on which the software is provided. The small cable is used only in the event that the interface is installed on the internal left-side bus. The jumpers on the printed circuit board are only modified in the event that the interface is installed in a nonstandard configuration. The instructions shown provide excellent documentation on any modifications necessary.

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Printer Control Functions

An ESC character is sent to the printer whenever a tilde (~) character is found in the text. Hexadecimal 40 is subtracted from the character code following the tilde before it is sent to the printer. These sequences are available:

~A	Move the print head 1 dot space to the right
~B	Move the print head 2 dot spaces to the right
~C	Move the print head 3 dot spaces to the right
~D	Move the print head 4 dot spaces to the right
~E	Move the print head 5 dot spaces to the right
~F	Move the print head 6 dot spaces to the right
~J	Full line feed reverse
~N	Start elongated print
~O	Stop elongated print
~Q	Select the proportional character set
~S	Select the standard character set (10 CPI)
~T	Select the condensed character set (16 CPI)
~\	Half line feed forward
~^	Half line feed reverse

Direct ASCII Control Characters

The driver processes only the TAB, LF (line feed), and FF (form feed) control characters. All other control characters are sent directly to the printer. This capability allows Backspace to be used. Sending control sequences directly to the printer can confuse the driver's tab, form feed and underscore logic.

Table 1. This table shows the control codes for the CT: device driver and their associated functions.

The device driver has the following features:

- tabs are converted to spaces
- form feeds are simulated with line feeds
- automatic form feed after specified line is printed
- single sheet or continuous sheet mode
- lines too long for the paper width wraparound
- full access to all special printing functions

In addition, there are extensive driver set configuration options:

PAUSE—enables the single sheet mode. The printer pauses at the top of each new page to allow operator paper handling.

NOPAUSE—disables the single sheet mode (as supplied).

PROPO—starts up in the proportional print font.

10CPI—starts up in the standard print font (ten characters per inch).

16CPI—starts up in the condensed print font (16 characters per inch).

PORTn—sets the base port to the octal value n. As delivered, the base port is 320Q (SERL 0).

LENGTHn—sets the page length to n lines, where the range of n is 4 through 127. As delivered, n=66 lines.

LASTn—sets the last line printed to n where the range of n is 4 through 127. As delivered, n=60th line.

HELP—prints a list of SET options.

The LAST line is followed by an automatic form feed. If LAST is set greater than LENGTH, no form feed will occur. In this configuration, the printer responds as if roll paper is being used, so that there is no page demarcation (the printout is continuous).

The control characters recognized by the driver and the resultant operations are shown in Table 1. Control characters other than those recognized and responded to by the device driver are sent directly to the printer, although doing so will confuse the device driver's control logic. The problem arises because control characters will be counted as printable characters, so the tabs, form feeds and underscores may be performed incorrectly. However, it is fortunate that control characters are sent to the printer, rather than being discarded, because you can then fully use the abilities of the printer (subscripting, for example). That also lets you upgrade the printer without having to upgrade the device driver. In our case, we have a Centronics 739 rather than a 737. The device driver still performs as designed, even though the printer is not the one for which the driver was designed.

Installation

The installation instructions included with the interface are excellent (written instructions and hardware included with the driver package are shown in Photo 1). The H-89 has two buses: the right side and the left side. The right-side bus seems to have been designed for I/O (input/output) expansions, while the left side seems to have been intended for memory expansions.

Installation of the interface on the right-side bus is simple; all you need to do is insert the interface board. Installation on the left-side bus is somewhat more involved, but is certainly not beyond the abilities of anyone who has built any electronic projects. In the case of the left-side bus, the instructions cover almost two pages in a sequential, step-by-step manner. If you follow the instructions, there is almost no chance of making a mistake. Check-out instructions are also included to ensure that the modification to the computer does not adversely affect the computer.

We installed the interface on the left side to allow maximum I/O expansion of our system, and to check the worst-case installation of the interface. As seen in Photo 2, modification to the computer for installation on the left-side bus consists mainly of attaching the three-conductor cable (seen in the photo between the memory chips in the upper center) to the right-side bus and routing it to the interface. Installation time was less than one-half hour from start to finish.

Instructions are included to let you hardware-configure the interface to any of the already decoded ports. A table that gives all information necessary to select and configure the interface for the desired port is included. The software portion of the driver is then reconfigured for the desired port using the Set program, as covered above.

The instructions state that systems with the H-88-7 upgrade ROM kit installed cannot use the cassette port. While that is strictly correct, the authors could have told the user that if the Z-47 eight-inch disk drive accessory is not installed, and is not intended to be installed, then U550 (Heath part number 444-61) could be replaced with the old U550 (Heath part number 444-43). That modification would then let you use the cassette port. That insufficiency of information aside, the documentation included in the interface package is excellent. As seen in Photo 1, the amount of written documentation included with the package is excellent.

The astute reader has probably

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questioned how Table 1 was created. The actual control characters are printed, even though, as control codes, they would be nonprinting. The answer is obviously that the driver was modified to use different control characters; then the table was printed. Not possible without the source code, you say? Exactly right—the source code is included with the driver. When was the last time you bought a software package that included the source code at no extra cost?

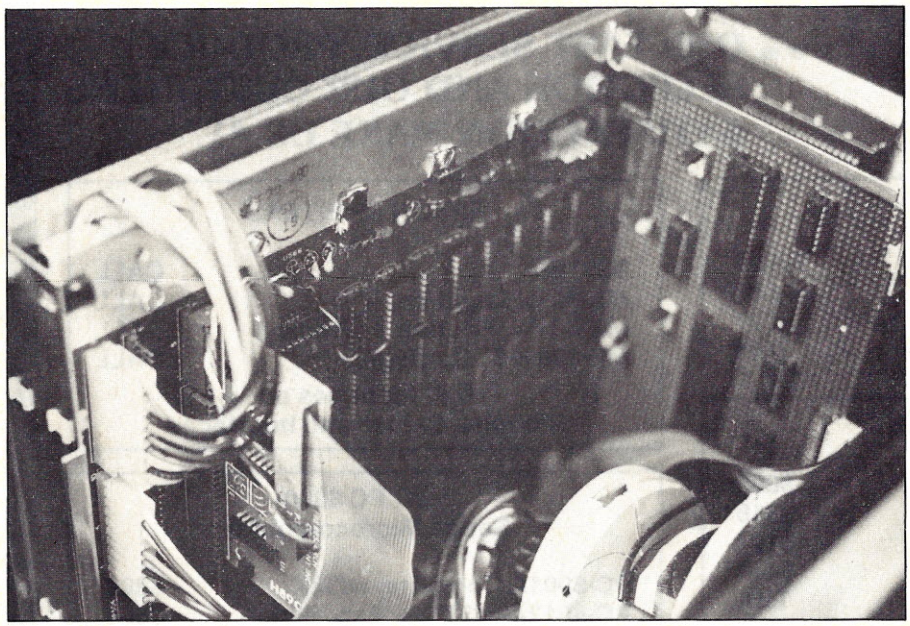

Photo 2. This photo shows the interface installed on the left-side bus. The small three-conductor cable is shown between the upper banks of memory chips. It was later tacked down with silicone cement to prevent movement. Observant readers will notice the jumpers on the printed circuit board that must be cut for left-side installation have not yet been cut.

Having access to the source code lets users with some assembly language experience modify the driver for custom applications. Having access to the source code in this case is particularly nice if you wish to learn more about Heath device driver code; the source code is very well documented, to the extent that a perceptive programmer could use this code as a basis for a completely different driver. Also included on the disk are the .LST file, the .DVD file (of course) and a test file that can be output directly to the printer to test for proper printer and driver functioning.

In our case, having access to the code lets us use the driver with Heath's AutoScribe word processor package. AutoScribe does not recognize the tilde (~) character, so consequently the first time the driver was used with AutoScribe, the Centron-

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ics 739 did not respond to any commands to change print font, etc. Changing the driver to function with AutoScribe took about five minutes. Pretty impressive.

Potential Problem

While the package is professionally designed and supported (the people at FBE have been very receptive to our questions about their source code), it is not without a potential problem (at least as far as we're concerned). The Centronics can print with the proportional print font, in which each character is spaced at a proportional distance with respect to the preceding character. That implies that each character has a different number of dot columns associated with it. For example, an "a" has 12 dot columns associated with it while a "z" has only ten. Therefore, any software that assumes that all characters are equally formed and spaced will have problems maintaining proper location of tabs, among other things. In my opinion, a device driver should maintain proper tab spacing irrespective of the print font. The CT: device driver has been modified by others to handle proportional tabs.

A tribute to the interface is the fact that at least one word processor package has been written expressly for the FBE Research interface and the Centronics 737 printer. That particular software package makes excellent use of the flexibility of the interface/printer combination.

That problem notwithstanding, the device driver package is excellent. The software is designed primarily to operate under HDOS (the Heath Disk Operating System). A patch is available to Heath's CP/M BIOS (Basic Input/Output System) for users operating under CP/M. Installation of the patch is straightforward and well-documented. The patch does not support all of the sophisticated control codes that the HDOS device driver does, however. It simply lets CP/M talk to the printer in the standard print font (10 cpi). In word processing applications, the word processor software must include the capability to output control codes directly to the printer in order to make full use of the printer's features. We also use Heath's Magic Wand, which outputs control codes directly to the printer.

Any H-89/Z-89 system that requires correspondence-quality print would certainly benefit from this driver. Of course, the actual quality of the print is solely dependent upon the printer used. If you're going to buy a Centronics 737 or 739 or an Epson MX-80, FBE Research has developed a very professional device driver that is exactly what the integrated system requires.

To overcome the shortcomings of the CP/M software patch, my company has improved the patch programs for the Centronics and Epson printers to let the user program the print font automatically at cold boot time (or any other time, by running the program from the keyboard) for the system. Now, instead of having to settle for the standard (10 cpi) print font, any print font may be selected. The improved patch programs are available from H & H Enterprises, PO Drawer H, Blacksburg, VA 24060, for $5 plus $1.50 shipping and handling. Interested readers should send their FBE Research distribution disks, to which the programs will be added and returned.■

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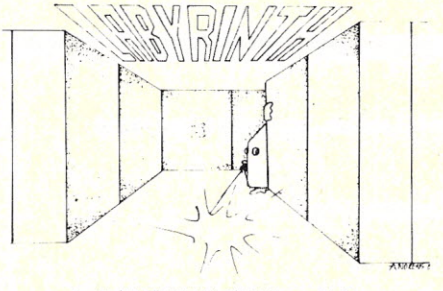
TINY COMPILER is written in BASIC. It generates native, relocatable 6502 or 6809 code. It comes with a 20 page manual and can be modified or augmented by the user. $24.95 on tape or disk for OSI or TRS-80 Color.



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Numeric Storage— As Easy as 1,2,3 . . .

This programming technique (that will work in most dialects of Basic) comes in handy when you have to store integers in disk or tape data files.

By Ken Knecht

Here's a way to let you store integers from 0 through 255 in a single byte or integers from 0 through 65279 in two bytes. This technique is especially useful for storing integers in disk or tape data files. A modification of the technique shows how negative integers can be stored as well.

Normally, you use at least two bytes to store an integer up to 255, using MKI$ to convert the integer to a two-byte string and CVI to get the number back. Even this won't help if you don't have these commands or their equivalent available, in which case you need three bytes for each integer, more if you had to use delimiters between the numbers.

You could convert the integer to binary and store it that way, but that takes a lot of effort to convert back and forth. It's also awkward to use, usually requiring peeks and pokes to the program or string storage area.

This simple method will work in most Basics. All you need are the CHR$ and ASC commands. These (or their equivalents) are included in most Basics.

The CHR$ command converts any integer from 0 to 255 to a one-byte string; for example,

```
A$ = CHR$(65)
```

The ASC command will convert any character or the first character in a string to an integer from 0 to 255; for example,

```
A = ASC("A")
```

or

```
A = ASC(A$)
```

Normally these commands are used to deal with ASCII values of characters, but I discovered another way to use them.

Listing 1 contains an example of a

```
10 PRINT 0, 10, 100, 255
20 A$=CHR$(0): B$=CHR$(10): C$=CHR$(100): D$=CHR$(255)
30 E$=A$+B$+C$+D$
40 PRINT LEN (E$)
50 PRINT ASC(MID$(E$,1,1)), ASC(MID$(E$,2,1)), ASC(MID$(E$,3,1)),
 ASC(MID$(E$,4,1))
60 END
>RUN
0           10          100         255
4
0           10          100         255
```

Listing 1. Sample program using the compressed integers technique.

```
10 A$=CHR$(INT(60000/255)): B$=CHR$(60000-INT(60000/255)*255)
20 C$=A$+B$
30 PRINT ASC(MID$(C$,1,1))*255+ASC(MID$(C$,2,1))
40 END
>RUN
60000
```

Listing 2. Storing 60000 in two bytes.

Address correspondence to Ken Knecht, 1340 W. 3rd St., Yuma, AZ 85364.

program using my technique.

The 4 printed by line 40 proves the four integers are stored in only four bytes. The results of line 50 show that the integers can be reclaimed from the string E$ in their original form.

Let's say you wished to store the monthly inventory turnover for 12 months of each item in an inventory list. The maximum turnover would be limited to 255. Using MKI$ and CVI, this would take 24 bytes, two for each month. Stored as numeric strings, as with some Basics, this would take at least 36 bytes, three for each month. Using the compressed integers you'd only have to store a 12-byte string for all 12 months.

If you have 5000 items of inventory this could save 60,000 bytes, or even 120,000 bytes or more if you had to store the integers as numeric strings. That's a lot of storage space!

You could also use this technique to store integers from 0 to 65279 in two bytes. Listing 2 contains an example of how to store 60000 in two bytes.

This could save up to three bytes per integer stored. Note the MKI$ and CVI commands limit you to 32767 as the largest positive integer.

As mentioned earlier, these techniques are mainly useful for storing integers in disk or tape data files; but when you have a lot of suitable integers to store, they can save a great deal of space.

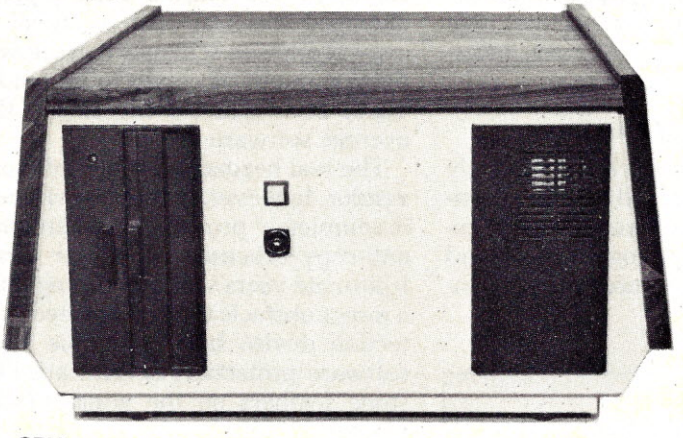
The main disadvantage is that these techniques won't handle negative integers without cutting the maximum integer size in half and using extra program statements. For example, Listing 3 shows how to store an integer from −127 to 127 in a single byte.

Get the idea? I'll leave it to you to work out a method for storing integers from −32639 to 32639 in two bytes. It can be done!

In all the program examples I concatenated the individual single-byte strings into a single string variable and used MID$ to break the string down again. This isn't necessary but makes handling a group of one- or two-byte strings easier. ■

```
10 A=120: B=-120
20 A$=CHR$(A+127): B$=CHR$(B+127)
30 C$=A$+B$
40 A1=ASC(MID$(C$,1,1)): IF A1<127 THEN A1=-127+A1 ELSE A1=A1-127
50 B1=ASC(MID$(C$,2,1)): IF B1<127 THEN B1=-127+B1 ELSE B1=B1-127
60 PRINT A1, B1
70 END
>RUN
120          -120
```

Listing 3. Storing an integer from −127 to 127 in a single byte.



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How Safe Is Your Software?

Copy protection schemes are, for the most part, ineffective against unauthorized duplication. Thwarting software-thirsty pirates calls for a change in modern microprocessor design.

By Jake Commander and G. Michael Vose

Microcomputing Technical Editors

Software pirates, brandishing the machine-language monitors, disassemblers and bit copiers that are the keen-edged tools of their trade, are a computer programming entrepreneur's nemesis. Sallying forth to engage the beleaguered programmer's every effort to protect the island of his precious creations, the pirate seems to relish the challenge of being the first to penetrate the secrets of any software protection scheme. In this quest, the software pirate, and many programmers, may be playing the ultimate adventure game.

Microcomputer programmers, being reasonably bright, sometimes even brilliant, have devised hundreds of schemes to protect their software. These schemes cover a range including the simple, the crafty or unexpected and the exhaustive. Many employ some hardware or take advantage of some peculiarity of the machine they work with. All are ultimately futile.

Regardless of how you feel about the issue of software protection, you may be interested to learn some of the techniques most commonly used. This survey of copy protection schemes won't attempt to catalog all of the ideas invented to date; neither will it attempt to show you how to break any given copy protection technique. It will, however, show why copy protection of microcomputer software can never be foolproof. That goal, desirable or undesirable, depending on your perspective, will probably have to wait for a new generation of microprocessor.

Why Protect Software?

A copy protection scheme is simply a technique employed by a programmer to render a software product uncopyable. Many programmers and software vendors use these techniques to prevent the unauthorized duplication of software that costs substantial sums to develop.

Uncopyable software is a vendor's dream but very often a user's nightmare. Since software is vulnerable to destruction from unexpected sources, users like to have multiple copies of a software product available. Therein lies the software copy protection dilemma.

There are ways to overcome this dilemma. Vendors can sell multiple copies at the original sale, replace damaged disks at cost or build in copy protection schemes that allow a finite number of copies to be made. These arrangements can satisfy the average software user.

The real headache for the software vendor, however, is that no software is completely protectable. Therefore, anti-copy schemes will anger some legitimate users while imposing only a minor obstacle to the dedicated protection device buster. In this way, software protection devices are like stone feathers on the wings of the vendor.

Copy Protection Schemes

Copy protection schemes fall into four broad categories: hardware dependent, load format alteration, software that checks the environment as it executes and software that executes through a "filter." Schemes from all of these categories involve an interaction of software and hardware—that's their ultimate vulnerability.

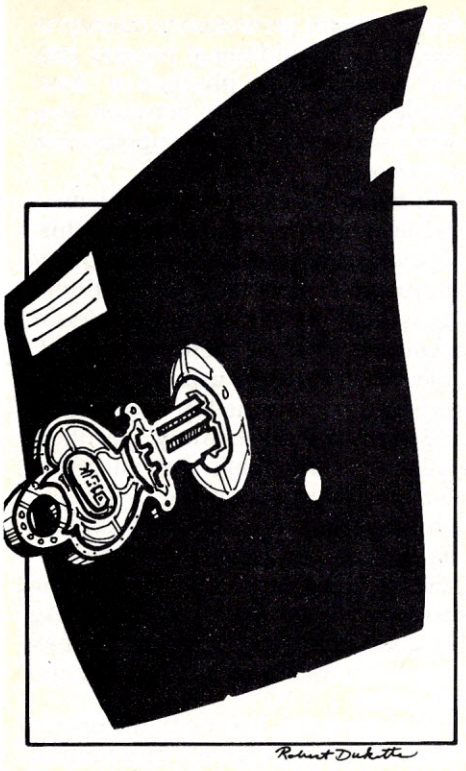
Anywhere software is used, the microprocessor is brought into the picture. Microprocessors, wonderful creations that they are, are simple,

Risk-Free Program Buying

A unique method of encryption to curb unauthorized copying of programs has been developed by Soft-Link of Los Altos, CA. Soft-Rack is a take-home software demonstration package that lets the buyer sample the applications software on his own system, without paying the full price of an expensive program in advance.

The customer can purchase and preview the basic demonstration package for about $50. If the customer decides to purchase the package, he makes full payment for the unlocking code.

Soft-Rack relies on a software lock to protect the master program disk. Applications programs can only be unlocked by a coded key furnished by the vendor to the buyer. This reduces the risk of buying an expensive program that does not function as anticipated, or is unsatisfactory for some other reason that could have been missed during an in-store demonstration.■



faithful executors of instructions. There are many ways to intercept those instructions.

Loading format alteration schemes are the most prevalent form of copy protection. They work with cassette tape and floppy disks. They use a simple conceptual technique. Most microcomputers load information from magnetic media using machine-language routines contained in read-only memory (ROM). These routines can be used to load a special, non-standard loader from tape or disk, which can then be used to load a program.

The program itself would be written so that it would load only using the non-standard format. For example, many tapeloading routines perform checksum operations which merely add together the value of the bytes (characters) in a record as they load into memory and check this sum against the last byte in the record which contains the sum. If the two numbers match, loading proceeds to the next record; otherwise, an error is generated. Altering the reading of the checksum can "fool" the microprocessor and make a tape copyable but unloadable.

Altering the format of floppy disks can be as simple as adding an extra track (a 41st track to a 40 track disk, for example) or leaving an unformatted track in the middle of the disk. The first information loaded from the disk would be a special loader; then the program would be loaded using the special loading routine, a routine which would look for certain special conditions such as the 41st track. A copied disk would not have a 41st track and would therefore be unloadable.

This process can be carried to multiple levels; one programmer devised a "nesting loader" scheme that loaded a special loader from the disk which loaded another special loader which loaded the program. All of these loading format alteration schemes can be broken, however, because the first information loaded is the code of the non-standard loading routines. This code can be disassembled and analyzed, and the scheme can then be figured out so that the pirate can overcome any alterations to the format.

Hardware protection commonly involves attaching a device to an addressable port on the machine. The software is then written so that the first thing the program does is check the port to see if the proper device is attached—if it's not, access to the program is denied. Once again, however, software dependency is built into such a system, so it can be broken.

Most other hardware-related protection schemes rely on some peculiar trait of the computer being used. Apple computers, for example, allow floppy disk information to be written on the boundaries between tracks, a good place to hide a key byte or routine without which a program cannot be loaded.

Atari computers let you set a byte that makes a warm reset operation actually perform a cold reset—which zeroes memory. Software protected by this device is the only information that can be in memory—any attempt to load monitors before or after the program is in memory clears the memory. This device is hardwired into the Atari, which makes it nearly foolproof.

Atari video games contain hardware specifically designed to make software piracy impractical. Using esoteric and seldom-used components, the hardware has been modified to execute instructions in a non-traditional manner. The instruction set may have been encrypted so that a call performs a jump or a load register operation—only Atari knows for sure. The scheme could be decoded, given enough time, money and an encryption computer, but the process would hardly be worth the effort.

The other major software protection techniques involve a tremendous processor overhead. They require that the processor check the environment as the program runs; as a result, they slow the program down substantially. These kinds of schemes can use a processor's interrupts to periodically intercept program flow to vector to an obscure memory location, check a byte and then return to the program at the next instruction after the interrupt.

Basic programmers have access to some simple but effective copy protection schemes. These techniques usually involve disabling break and reset routines so that once the program is loaded, access to the system level of the machine is denied. Basic programs can contain embedded tabs or control codes that make a program's code unlistable.

Many disk operating systems also provide protection levels that can be invoked to prevent access to a Basic or machine-language program through the operating system. Access can be obtained, however, by entering the user memory using a machine-language monitor.

Another protection scheme available to the sophisticated Basic programmer is the ability to save Basic programs under system format with predefined variables. This technique involves placing a key variable in the code, saved by a special utility, that would not appear in a listing of the program. This variable could be used in a vital routine that would cause the program to crash if it were absent. Therefore, any copy made using Basic I/O routines would not run properly.

To Protect or Not to Protect

Copy protection schemes are likely to be with us for some time because software vendors and programmers have a vested interest in keeping unauthorized duplication to a minimum. Copy protection can be useful because many consumers are not technically sophisticated enough to break the protection being used. But there will always be an elite group of users who will break a copy protection scheme because of the challenge involved, and then give away copies of the software to prove their skill and cunning.

Is there no foolproof way to protect software? Mainframe computers have for many years contained processors that make protection easy.

Why can't micro manufacturers come up with similar devices?

The historical situation dictated during the evolution of modern semiconductor devices that space on a chip was at a premium. Designers were concerned with developing processors that worked, yet could still be accommodated on a single chip; furthermore, the design had to permit mass production. Early four-bit microprocessors evolved, as a result, with the minimum circuitry that still allowed the device to work.

When eight-bit processors were developed, once again only the minimum circuitry was added. No one worried about circuitry that could be used for software protection; that was "bells and whistles," which designers opted to ignore.

> There will always be an elite group of users who will break a copy protection scheme because of the challenge involved.

From the perspective of 1982, it is obvious that the designers of the early processors erred a bit on the side of conservatism; subsequent designers followed their lead. All that really is necessary to add hardware-dependent software protection to microprocessors is an additional register pair and circuitry to produce a master/slave relationship between system software and application software.

In mainframe computers, the master/slave relationship works like this. Memory is partitioned into uniquely addressable sections. This partitioning is done by the central processor according to what memory is available. The processor uses two special registers to store the top and bottom addresses of a memory partition while it is accessing that partition. This partitioned memory is accessible only by the computer's operating system, and only when the computer is in master mode. Monitors or disassemblers can be used to access the code in any memory partition as long as the machine remains in master mode.

At some point, however, the operator decides to switch the system into its slave mode. Once this switch is made, each memory partition becomes an island unto itself. Control cannot be passed from one memory partition to another. If a program attempts to address memory locations outside its partition, an error message will be generated and, in some cases, the programs attempting the illegal access will be thrown out of memory.

To use this kind of master/slave system, the manufacturer of the microcomputer system (and those developers willing to pay for the privilege) would be the only users who had access to the operating system in master mode. The majority of users would buy the system with an operating system in slave mode. Therefore, they could run programs but not copy them unless the program they were using had a copy routine built in. Certain operating system utilities could have limited access to memory partitions outside of the one in which they resided with special permission from the operating system (i.e., the manufacturer).

This kind of master/slave design can be incorporated into the design of modern microprocessors. In fact, it is surprising that the latest generation of processors do not contain this capability. Until they do, there will always be a pirate, sword in hand, ready to chop his way into the bowels of the machine looking for the key to unlock the door to the treasure—the "protected" piece of software. ■

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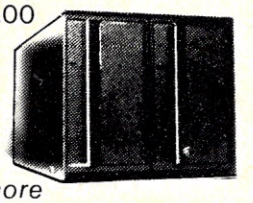

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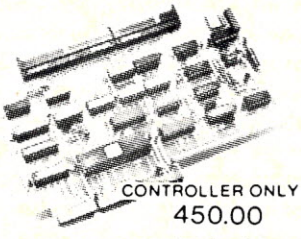

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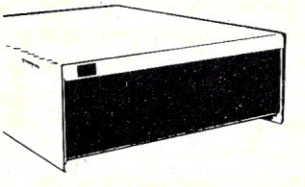

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Software Protection— A Legal Overview

Legal protection for software does exist. But is it adequate?

By Jeffry Kamenetz

Anyone who has ever written a computer program knows that a lot of work is involved. Both the professional computer programmer and the kitchen-table artist expect to write or rewrite most of their software three or four times before the program is officially released.

The industry standard for generating machine-language code used in computer operating systems and games, where speed is a must, is ten lines a day. True, while a good programmer can probably write those ten lines in under five minutes, one must consider all of this person's time. That would include typing in, debugging, rewriting, debugging, product testing and more debugging. And if he is doing his job, there will be an endless river of documentation.

For example, imagine a typical program of 16K bytes. This would be equal to 16,384 bytes of code at about 2.5 bytes per line. This is about 6553 lines of code, which at ten lines per day would take 5243 hours. Assuming that overhead and the cost of labor are about $30 an hour, this hypothetical software program represents $157,284 of investment.

Question: what protection is afforded the developer of this program once the product is marketed? Despite the competition's ability to apply reverse engineering, some means of protecting this special form of intellectual property do exist.

Trade Secrets

A trade secret is some special knowledge that one's financial concern has, but is unknown to others in the same industry. Infringement of a trade secret is a violation of state law. Perhaps the best example of a trade secret is the formula for Coca-Cola.

The classic introduction to trade secrets comes from Restatement of Torts (1939):

> A trade secret may consist of any formula, pattern, device or compilation of information used in one's business, which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers. . . . A trade secret is a process or device for continuous use in operation of the business. Generally, it relates to the production of goods, as, for example, a machine or formula for an article. It may, however, relate to the sale of goods or to other operations in the business, such as a code for determining discounts, rebates or other concessions in a price list or catalogue, or a list of specialized customers, or a method of bookkeeping or other office management.

The basis for trade secret laws is common law instead of statutory law. Trade secret protection is implicit in contract law and the law of unfair competition.

It is up to the possessor of the secret to maintain its confidentiality. If the owner inadvertently loses this secret, then the secret is forever part of the public domain.

When it comes to software, the preferred method of protection is the trade secret. Typically, the developer of the software will supply only an object file listing in the form of a magnetic tape, floppy disk or read-only-memory (ROM). While it is possible to reverse-engineer the process and figure out how the program works, it is difficult at best.

This strategy is reinforced with some clever engineering practices to prevent reading of the object code. If the file is on a floppy disk, the disk may have a special self-destruct routine that activates during copying. Another technique is where the floppy disk program references a special software serial number hidden in the hardware of the host computer. Then, every time the program is run, the serial number is compared against the floppy disk number to make sure they match. This implies that the disk would be specific to one particular user's machine. When an illegal copy of the program is loaded onto another computer, the check fails and the program aborts.

ROMs, on the other hand, can be embedded in a potting compound. This makes it impossible to access the chips without damaging them. A variation on this theme includes throwing metal particles into the potting compound to keep other hardware from being X-rayed.

However, the businessman's answer lies in drawing up license agreements between the program developer and the user.

Everyone thinks software protection issues involve stealing intricate programs. Case in point is the Data Cash Systems, Inc., case where a

Address correspondence to Jeffry Kamenetz, 14 Sadler, Windsor Locks, CT 06096.

read-only-memory was allegedly copied outright. But there are other, no-so-common, problems, especially with trade secrets. If the developing firm protects the work as a trade secret, the firm must have its employees sign a nondisclosure statement. Either the employer or the employee ends up losing on this practice. Most employees are reluctant to sign because it tends to scare off future prospective employers. They thus risk not being hired.

(Note, however, that an employee's continued employment once hired cannot be contingent upon signing such a statement.) If the programmer is not hired, the company loses because it has lost a good worker and is forced to spend more money searching for another employee.

On the other hand, the hiring company must consider what nondisclosure statements the potential employee may have signed prior to making a job application. For example, consider the employment of a programmer who was involved in writing an operating system for his previous employer. If this technician were to write an operating system for his new employer, there is the possibility of inviting a trade secret infringement suit.

> The easiest way to obtain protection is by applying for a copyright.

Also, consider what happens if a commercial concern buys or rents software. More likely than not, the source of the software will require the user to be licensed. That is, the user agrees not to copy or make publicly available the program. Very often, there are questionable clauses giving the licenser the right to revoke the licensee's use of the software. This is analogous to credit cards—a customer is given the right to use one but the card still belongs to the credit card company. This enables the credit card company to impound the card if it is stolen or if the user is delinquent in payments. With software, however, the improper acts include copying or selling the program.

The licensee can be held financially responsible if the program is stolen. The big fear, of course, is that an employee may steal a copy of the program and quit, leaving the employer liable. One solution is to have the employees sign nondisclosure statements, but that, as previously mentioned, has its drawbacks.

The use of such programs creates another problem, as Robert P. Bigelow points out in an *Infosystems* article (see References):

> A program that costs $500 a month may become so integrated with the company's operations that losing the right to use it could cost millions in lost productive time, poor customer relations and delayed financial statements.

In summary, trade secrets provide shaky protection at best.

Copyrights

By far, the easiest way to obtain protection for a program is by applying for a copyright. The cost is about $10 and requires the programmer to fill out Form TX and send two copies of the publicized work to the United

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A copyright usually runs 50 years past the life of an author. If you wrote the program for hire, then the life of protection is the lesser time of 75 years from publication or 100 years from when the program was written. The copyright guarantees the programmer exclusive legal rights to the copying of one's "expression." If, however, the competition rewrote a copyrighted program so that its function was the same, there would be no grounds for claiming copyright infringement. Rewriting programs requires little effort by software pirates. A software thief could even legally copyright his revised program. Thus, copyrights have limited value.

Currently, copyright laws cover object code programs. The 1976 copyright laws represented landmark legislation, in that source listings were covered on the grounds that they were simply text. However, the law made no attempt to relate electronic storage mediums such as ROM (read-only-memory) and floppy disk to copyright protection. Hence came the infamous case of *Data Cash Systems v. JS & A Group, Inc.* After Data Cash Systems began marketing a chess game for $169, JS & A came out with a unit that bore an amazing likeness to Data Cash Systems'. Not only were the programs identical, but JS & A Group, Inc., had the audacity to sell the game for $99. The final and standing decision was made by the U.S. Court of Appeals for the Seventh Circuit, which agreed with a lower court's finding that object-code programs are not copyrightable.

This void in the copyright law was filled in the final days of the 96th Congress when they passed the Computer Software Copyright Act of 1980. The law amends the 1976 copyright statute by defining a computer program as a set of statements or instructions to be used directly or indirectly in a computer to bring about a certain result. Says Christopher Kern in a *Byte* article, "The word 'directly' refers, of course, to the object code."

It should also be noted in the *Data Cash* case that even if ROM had been copyrightable at the time there is still another problem. Nowhere in the ROM was there anything that faintly resembled a copyright notice. Once something is published without the notice, all copyrights are irrevocably lost to the public domain. It was somewhat foolish for Data Cash to bring the infringement suit in light of the missing copyright notice.

> The panacea for all computer protection most likely lies with U.S. patent law.

Copyright protection is rarely used seriously. Many amateur programmers like the idea of copyrighting their works. Many software houses place the notice in the beginning of their programs but never bother to file their copyright with the Library of Congress. These notices are intended to discourage others from copying the program. Many companies that do follow the whole copyright process understand that the work may still be misappropriated. The Library of Congress is also losing its composure with respect to copyrights. There are thoughts of extending copyright protection to any published work that bears the notice. This would mean the Library would no longer require a copy of the work.

Before leaving copyrights, note the interesting parallel between records and computer programs. When phonographic records first were produced, there was no copyright protection. Almost immediately a whole industry developed in pirating records. The copying of records became financially disastrous to the legitimate record producers. Congress realized the problem and extended the copyright laws to cover records. Like records, computer program protection evolved within the copyright laws to prevent the onslaught of chaos in the industry.

Patents

The panacea for all computer protection most likely lies within the U.S. patent law system. This is because, as writer Robert J. Frank says, "Patent law is intended to give protection to apparatus and methods which are embodiments of an idea." That is, the underlying concepts of an invention are also protected. Thus, unlike copyrighted programs, patented programs cannot be modified, transposed or translated.

Unfortunately, while the computer programming industry may be ready for patents, patents are not ready for the computing industry. Government officials appear to have a lot of inertia with respect to accepting computer programs. The foremost culprit seems to be the U.S. Patent and Trademark Office (PTO).

Ideally, the PTO should be very close to the cutting edge of technology. They are the referees in this game. So far, the PTO has been mule-like in refusing to patent anything that smells the least like a computer program. Then there is the Supreme Court, which would probably rather not get involved. However, when they agree to hear such cases, they have adhered to one simple guideline—promote the useful arts.

To many observers, including the Court of Customs and Patent Appeals (CCPA), their decisions are hard to interpret. Three cases tend to stick out from the crowd: *Benson, Flook* and *Diehr.*

The case of *Gottschalk v. Benson* (409 US, 1972) could be considered a primitive version of today's typical software patent case. On Oct. 9, 1963, Arthur C. Tabbot and Gary R. Benson filed a patent application "for Conversion of Numerical Information." Their employer, Bell Telephone Labs, Inc., intended to use the invention in the infamous PBX (private brand exchange) system that Bell was marketing. Specifically, the invention was an algorithm which converted binary-coded-decimal data to pure binary numbers. Both the examiner for the patent application and the PTO Board of Appeals rejected the claims of Benson and Tabbot that the algorithm was patentable.

Then the CCPA reversed the Patent and Trademarks Office. The Commissioner of Patents, Gottschalk, appealed the decision to the Supreme Court. The Supreme Court sided with the Commissioner:

> It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgement below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

The interpretation of this decision varies tremendously with that of the observer. Many experts speculate that the Court was purposely vague

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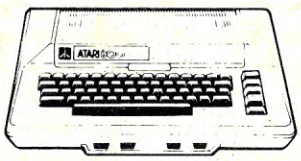

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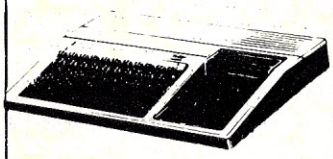

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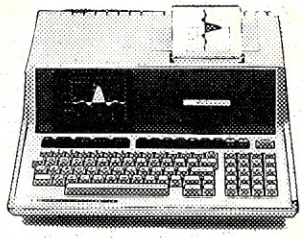

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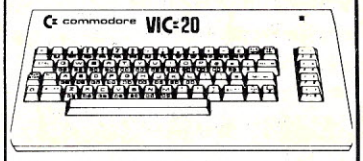

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in certain statements because the justices were ignorant of computer technology. This is understandable in light of computers being relatively new and the fact that this case was the first of its kind.

Unfortunately, the general lasting impression was that all computer programs, being algorithms, were not patentable. Algorithms themselves are not patentable because they are not useful.

The second noteworthy case is *Parker, Commissioner of Patents v. Flook* (437 U.S. 584, 1978). Flook developed a system whereby alarm limits were calculated by a computer program. The alarm limit signaled that an inefficient or dangerous condition existed during the chemical processing of hydrocarbons. The inventor openly admitted the importance of the computer program. However, he claimed the invention was patentable since the algorithm was tied to a specific process.

The Supreme Court rejected Flook's claims by 6 to 3. Justice Paul Stevens, who wrote the opinion for the Court, said the processes were already known. However, there was a condition to this statement:

> (The) respondent's process is unpatentable, not because it contains a mathematical algorithm, but because once that algorithm is assumed to be within prior art, the application, considered as a whole, contains no patentable invention.

The Court's reasoning is considered faulty by many experts in the field. Although some things are known about the catalytic hydrocarbon conversion process, Dale R. Flook's process was novel. Justice Stewart, who dissented in *Flook*, made an elegant statement to the effect that natural processes are not patentable subject matter. The Justice's statement is true, but does not apply since the process does not exist naturally. Rather, Dale R. Flook invented the process, which presumedly had never occurred before.

Of what value, then, is the Flook decision? First, it shot down a small rally by the pro-software-patenting forces. Several previous victories had given them momentum. By the same token, it reinforced past anti-software-patenting victories, including *Benson*.

Just as important, the Court did not jump on the opportunity to rule that the subject matter was not patentable. It was as if the Court was thinking that *maybe* computer programs do constitute patentable material. The incorrect arguments made about the case by the Court further enhanced this possibility.

The third major decision in protection of software is the case of *Diamond, Commissioner of Patents v. Diehr*. The inventor developed a system for curing rubber under computer control. This controller monitored the temperature inside the furnace and stopped the process when the rubber had cured. The Supreme Court ruled by a narrow margin of 5 to 4 that the Diehr invention was patentable.

Diehr bears a strong resemblance to *Flook*. The difference in the eyes of the Court was in the novelty claims. In *Flook*, the novelty was in the algorithm, not in the calculation of alarm limits. An algorithm does not constitute statutory subject matter. In *Diehr*, the whole system was considered novel, which is the basis for all patents. That is, monitoring the temperature in real time and then automatically shutting off the furnace was genuinely novel.

The acceptance of a patent application including a computer program is the significant part of this case. Justice William Rhenquist, speaking for the Court, said, "A claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program or digital computer."

These three cases, as well as many others, are important because they are the precedents for future software-patent cases. The concept of a precedent is referred to as "stare decis." It is unfortunate that the Supreme Court could not rehear the cases of *Benson* and *Flook*. If they could, they would have the opportunity to clarify their arguments, even if the decisions were to remain the same. The *Benson* and *Flook* decisions and arguments tend to push the Court into anti-software-patent decisions. Currently, any future decisions reflecting enlightened thinking could cause confusion due to inconsistencies with earlier decisions. However, some may argue that this has already happened in the two similar cases of *Flook* and *Diehr*.

It seems as if the biggest hurdle that one has to overcome when patenting software is the requirement of statutory subject matter. The philosophy behind the patent system is that the application of ideas, but not ideas alone, should be patented. Ideas without an application do not fit the patent system definition of being "useful." Remember that ideas are related to algorithms, which in turn are related to computer programs. In *Benson, Flook* and *Diehr*, the inventors were cautiously avoiding making a claim on the computer program *per se*. Thus, since protection of software is in its infancy, attempting to patent a software program is out of the question.

There are two means of claiming patentable subject matter for software-based inventions. First, one could claim that the program is a process, which is one of the four classes of patentable inventions. A process—a way of doing things—could apply to software. Nevertheless, the program must be tied to some concrete application. Also, the software-based invention must meet the same requirements as another invention—it must be novel, useful and nonobvious.

Another criterion for software-based process patents is known as the "mental step doctrine" or the "paper and pencil test." You can't patent a process consisting entirely of mental steps, since such a process is a law of nature or a disembodied idea.

Alternatively, one could claim that the invention was an extension of a machine. An excellent example of this is the first claimed software patent. Martin A. Goetz of Applied Data Research applied for a patent where the software was hardwired electronics. The Patent and Trademarks Office arbitrarily decided that his invention was not software. It would, therefore, not be an algorithm and the invention would still be patentable on this account.

One could argue that, therefore, ROM and floppy disks would be patentable. Unfortunately, this view has not been widely accepted. This case underscores the importance of the software definition debate. Unlike the wording used in previous decisions by the judicial system, software must be rigorously defined. It seems foolish to spend large amounts of time and money on such an endeavor, but it is necessary.

The last major stumbling block for a software invention is the nonobviousness requirement. This criterion is unusual in that it is relative to the inventor. According to 35 USC Section 103:

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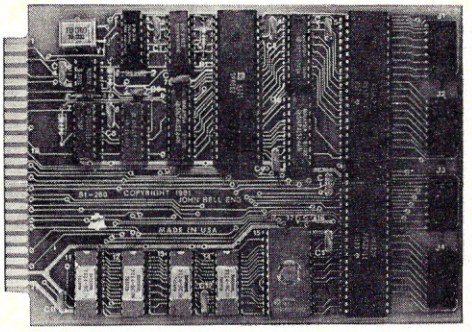

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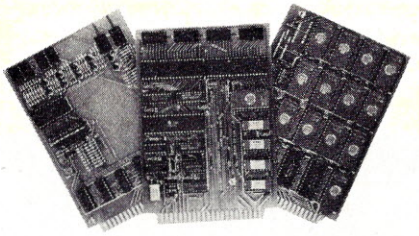

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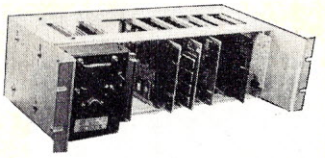

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A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title (Title 35), if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention was made to a person having ordinary skill in the art to which said subject matter pertains. . . .

In summary, a pure computer program patent application has no chance of being accepted unless Congress changes the law. The only use of the patent-pending notice on a program listing is to deter misappropriations of one's work. On the other hand, inventions in which a computer program is used in a machine or process claim patent (*Diehr*, for example) are patentable when new, useful and nonobvious.

A Proposal for New Legal Protection of Software

The laws concerning legal protection of computer software are still evolving. In the last few years, the focus has been mainly on decisions coming from the court system. Many, however, feel that Congress must legislate the proper protection. After all, what can you say about a system that allows copyrighting of phone books and the patenting of over 100 different features of vibrators as sex aids but will not provide full protection to computer programs?

The best way would be to modify the current patent law system to include special patents for software. These might be mini-patents having a life of, say, seven years. This way, adequate protection would be afforded the inventing company, but not so much protection that the rest of the high technology industry would be choked off. Ultimately, a larger number of computer program patents would be rejected over time as prior art and obviousness came into play.

The flood gates would open if such a move was made. Currently, the patent office has a backlog of some 3000 software-related patent applications in spite of PTO's well-known position regarding patents. Imagine how many applications would be filed if software was declared to be patentable.

Could the Patents and Trademarks Office (PTO) process software-based patent applications? Skeptics argue that the PTO would not be able to adequately search for prior art. This is a moot point, since if there really is prior art despite the issue of a patent, then the patentability of a program, or invention, could still be contested by a competitor. The system could still work whether policed by the government or zealous, possibly self-serving, members of the private sector.

Besides wearing egg on its face, the PTO must confront another problem from revoking a patent. What happens to the money made by the company to which the patent was given? By the same token, what compensation is given to the competition from having the government grant one firm a monopoly? I would propose the following scheme.

First, all programs be assigned a fixed market worth based on the value of comparable programs and the judgement of the patent examiner. Second, have the software vendor place any amount received in excess of this fixed worth in an escrow account bearing interest. This extra amount of money is compensation

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for the novelty, and thus patentability, of the program. If the patent survives throughout the duration of the patent term, then the company may pocket the escrow account. If the patent is invalidated during its lifetime, the amount in escrow, plus interest, is returned to the users.

This proposal rewards the software inventor what he is due and negates the patent advantage when he has tried to protect an unpatentable program. The users of the software and the competition can protect themselves, since any of them can initiate the invalidation procedure. The invalidation procedure is simple, requiring only that the Commissioner of Patents be informed of the reason(s) why the patent should be held invalid. The Commissioner's duty is then to void the patent.

The old school of thought that programs are algorithms and thus should not be patented is erroneous. These critics point to the 200-year philosophy inherent in the Constitution stating that algorithms by themselves are not useful, but that the application of them could be. Two hundred years ago, an algorithm was some relatively simple set of equations that tended to be theoretical or purely scientific in nature. Hence an algorithm was not considered useful. Computer programs today are useful when they save time and money computing financial records, retrieving and storing information and simulating physical processes.

And what of the added cost incurred to the Patent Office as a result of processing software patents? One must contemplate the cost of not having patentability for software. If there continues to be a lack of protection for software, software development houses will lose their incentive to invent software. The whole industry could fold up. This is especially grim in light of foreign competition in other markets.

Also, software is essential to the well-being of any hardware manufacturer. A case in point is the Texas Instruments TI 99/4 home computer, which was a dismal financial failure because of little software support. Unquestionably, the cost of implementing a patent system or similar strong protection for software is much less than the cost of not having such a system.

Currently, the American Patent Law Association has a subcommittee working on the protection of software. Internationally, the World Intellectual Property Organization is working on the same idea. Even Congress is rumored to be investigating the possibilities. It is expected that the whole process will be iterative. First, a group will propose a change and then the critics will come in and

Programmers Fight Back

Some interesting events have occurred recently in the area of legal protection for software. Trade secret methods are becoming more sophisticated. For example, a new Basic compiler that came on the market recently has an option for using serial numbers to access already compiled programs. If a user/customer wants to run the program, he must provide the correct serial number, or the disk on which the program resides will self-destruct.

Also, some software houses are getting tricky with their license agreements. After a customer signs such an agreement, he is given a personalized copy of the program. Whenever the program is run, the licensee's name is displayed along with the copyright statement. For example:

Copyright 1982 by John Smith
Note: The program is licensed only to Joe User by John Smith.

If the licensee gives the program away to a friend, the bootlegged copy will reveal the identity of the original software pirate. Thus, software users will have a good incentive for not breaking their license agreements.

Copyright controversy has been on the rise. Atari has been shaking up the industry with tough talk against alleged copyright infringers. On a related issue, Al Tommervik reports on the precedent of the obscure "ten foot rule." A Nebraska judge held that if a "reasonable person could not at ten feet, tell the difference between two competitive products, then there was cause to believe that an infringment was occurring."

Roy N. Freed of *Software News* detailed a move by the Copyright Office to prefer source code registrations as opposed to object code. This would detract from the benefits of copyright protection because of the higher level of disclosure required by the author. Note that source code such as "A=B*EXP(-DT/TAU)" is more explicit than an object code of "FE 56 DE 2C 3A . . ."

Freed also reminds us to place the copyright notice not only at the beginning of the program, but on the storage medium itself. For a disk, one would write the copyright on the hub. Also note that one's copyrights (one's right to copy) can precede the actual copyright registration. This means, you can send your program to software houses without the fear, at least in theory, of being the victim of a software pirate. It is illegal for them to distribute your work without a formal written agreement signed by you. However, the author must be prepared to go to court if necessary to implement this right. Sadly, this is sometimes not practical or possible in terms of documentation (of the infringement), time and money involved.

Finally, S. Pal Asyn claims to be the first patentee (#4,270,182) of a software program. This computer analyst developed a high powered information retrieval system. If his claims are correct, he has broken new ground in the field of software protection. As for Asyn, he is busy selling, you guessed it, a book on how to patent software.

References

Freed, Roy N., "Law Discriminates Against Micro Software." *Software News*, January 4, 1982, pp. 13, 14.

Freed, Roy N., "Brouhaha Manifests Copyright Ignorance." *Software News*, February 2, 1982, pp. 19 and 24.

Needle, David, "First Patentee Writes 'How to Patent Programs'." *InfoWorld*, February 22, 1982, pp. 1 and 5.

Tommervik, Al, "The Great Arcade/Computer Controversy." *Softline*, January 1982, pp. 18-22.

send the authors of the proposal back to the drawing boards. We must all wait and see what develops.

Conclusions

Patents unquestionably hold the greatest protection for software because the idea itself is protected. There are, however, three current problems with patents. First, they are very expensive to draw up and obtain. An inventor should expect to pay over $30,000 to successfully process a patent. This includes the inventor's time, lawyer fees and a prior art search. In addition, once the patent is issued, it is up to the inventor to enforce his patent. This requires initiating a very long and expensive infringement suit. The amortization of these costs tends to make patents unprofitable.

Second, patents are currently only being granted for software when it is part of the system. They are not being given out for software alone. As in *Diamond v. Diehr,* the software must not appear as one of the claims. Rather, the integration of a computer and its software and some process may constitute a novel, nonobvious and useful idea that is worthy of a patent.

Third, if it was possible and advantageous to apply for a patent solely on a computer program, would one accept it? Many big corporations would say no. In light of the IBM case, patents are becoming associated with antitrust suits. Indeed, a patent may grant you exclusive rights to an idea, but it does not guarantee the right to make, use or sell the embodiment of that idea. In the IBM case, the government has been alleging in court that for some 11 years, IBM has used its 50,000-plus patents and other advantages to cut competitors out of the marketplace.

The cost of losing an antitrust case is expensive. The Justice Department may rule that a large corporation such as IBM must divest into smaller companies. Or the firm may be required to extract itself from a market and let others step in and be given a fair chance. In a previous case, IBM was forced to stop renting keypunch machines and start selling them. Also, IBM was ordered to share specialized knowledge with its competition. The perseverance of the Justice Department in applying the Sherman Act of 1891 is a genuine threat to the patent system as a whole.

Copyrights, on the other hand, protect the right to publish the document in question. If the work, as the law is currently interpreted, is rewritten, then the desired protection has been circumvented. This is easily done because the work, by virtue of the copyright, is a document made public.

The trade secret is the weakest type of protection from a legal standpoint. For successful implementation of an infringement suit, one must prove that the information was obtained by unscrupulous means. The necessary proof is difficult to come by.

> The best solution is to modify the current patent laws.

I have some specific recommendations for firms contemplating protection for their software. For most programs, the trade secret is the best route to go. Unlike the copyright, the critical information comprising the worth of the program is not a matter of public record. It is simple and works fairly well. In protecting the trade secret, one is advised to employ every method and trick to thwart competition applying reverse engineering. For ROMs, this may include nonsense instructions and erroneous data coupled with false starting points.

There are very few examples where it may be advised to apply for a copyright. If, for example, one had a unique set of data used by a conventional algorithm, then it would be worth copyrighting. An example might be a computer version of the game Boggle. This is a word game where a player tries to form as many words as possible using strings of adjacent letters. In the original board game, the letters were faces of 16 cubes spilled into a tray. The computer version enhances the play of the game by forming the game board automatically and performing timing functions. Copyrighting the computer version (erroneously assuming that the game board version was not already copyrighted) would make sense. While writing the algorithm is trivial, coming up with the data is hard. It seems that nothing (but the original data base representing each of the 16 cubes) has the degree of excitement that the initial version had. That is, the data is critical to the success of the game. In this case it would be wise to protect the data by copyrighting the computer program.

The ability to adequately protect software is and will be in limbo for two reasons. First, the judges in the court system that help shape the law are ignorant in the areas of patent law, let alone engineering. In the New York Court District, one judge with a patent law background was removed, in effect, from hearing patent law cases. This occurred because of his competence in judging a few initial cases. In these cases, he overturned some faulty decisions by previous judges. His actions were particularly embarrassing to the other judges and it was decided that he should be kept from hearing patent law cases altogether.

Second, it would be very difficult to draft a patent law amendment for computer programs which is not either overly or underly protective. The benefits of protecting and providing incentives to one inventor must be traded off against the potential stifling of the competition. Ultimately, any worthwhile invention performs a service to the public. However, the question arises—would the issuing patent discourage or prevent other useful inventions from coming to market? The answers are far from being simple.

The software protection issue could take one of two possible directions. First, some think copyrights may evolve through future court cases to encompass a larger protection than first thought. This would imply that parts of a program or the underlying idea (the embodiment) of a program may be protected. This seems doubtful since the intent of the copyright law protects only the right to publish one's expression. Second, a minipatent or a derivative could be legislated by Congress. There seems to be some support in government for this idea.

On the other hand, many believe that protecting software is a big can of legal worms. They believe that algorithms and computer programs should be shared with the rest of society in general. What protection is needed is provided by trade secrets and copyrights.

As for the future, the form of protection that will be in vogue is anybody's guess. It all depends on programmers, engineers, judges and Congress. Any bets?■

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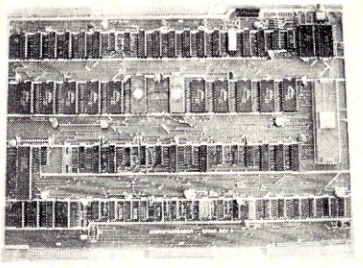

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Protecting Intellectual Property

A Primer on the Patent System

A patent is probably the most misunderstood concept that an inventor could ever foster. Protection for intellectual property is not a basic right or common law to the citizens of the United States. Patents are a grant by the sovereignty of our government. The federal bureaucracy is, in effect, voluntarily helping the inventor. The issue of a patent is a negative right in that it bars others from benefiting from the embodiment of one's ideas. A patent virtually gives the inventor a minimonopoly for 17 years.

The ultimate concern of the government is that technology is aided in its progress, which will make the country prosperous. Patents provide an incentive for investment. Also, the publication of patents gives others knowledge that enables them and society to leap forward in technology.

The historic basis for the U.S. patent system comes from the Constitution. Drafted during the Constitutional Convention in Philadelphia 1787, Article I, Section 8 states:

> The Congress shall have the power. . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

All inventors must meet some basic requirements to be patentable. The list of requirements is as follows:

1. Subject Matter Requirement
2. Originality of Inventorship
3. Novelty
4. Utility
5. Nonobviousness
6. Statutory Bar Requirements

The subject matter for a patent must be a process, machine, composition of matter or article of manufacture. On the other hand, the list of ineligible subject matter includes "printed matter, products of nature, ideas and scientific principles." The article of manufacture is sort of the miscellaneous clause to Section 101 of Title 35 which includes almost anything not covered by the other three classes.

Originality of inventorship means that only the inventor or inventors may apply for the patent. This does not rule out that a second party could be named the assignee or owner of the patent. The assignee is the designated party to reap the benefits of a patent.

All inventions must be new or novel as required by Section 101 of Title 35. This means that an invention could not be patented if a previous patent was issued in the U.S. or another country. Similarly, if the idea was described in printed matter anywhere in the world, the idea is no longer considered novel. The invention must not be used by others in this country. Finally, the invention must not have previously been abandoned, suppressed or concealed.

The subject of a patent application must hold some commercially useful purpose that is not illegal, immoral or contrary to public policy. In addition, the device must perform as claimed.

The invention must not be obvious. The idea of the requirement is to limit the number of patents. The intent of the patent system is to reward innovative thinking, not the ability to observe the trivial. Sometimes, the obvious charge comes from some prior art in the field. Any library in the world may have a book or magazine that is a time bomb waiting to destroy the patentability of someone's invention.

Finally, there are the statutory bar requirements which discourage inventors from neglecting or concealing their ideas. Specifically, the inventor must file an application within one year of public disclosure. Public disclosure may be anything from selling the invention to telling your old college buddy about your hot new idea. The recommended course of action for inventors is to make application as soon as possible.■

J. Kamenetz

References

Becker, Stephen A., "Legal Protection for Computer Hardware and Software." *Byte*, Vol. 6, No. 5, May 1981, pp. 140–146.

Bigelow, Robert P., "Is There Legal Protection for Software," *Infosystems*, March 1980, pp. 104–108.

Burge, David A., *Patent and Trademark, Tactics and Practice*, a Wiley-Interscience Publication, John Wiley & Sons, pp. 1–153.

Davis, Harold L., "Computer Programs and Subject Matter Patentability," *Rutgers Journal of Computers and the Law*, Vol. 6, No. 1, 1977.

Frank, Robert J., "Patent Protection and the Computing Arts," *Computer*, July 1979, pp. 66–73.

Freed, Roy N., "Patenting Not Appropriate for Every Program," *Software News*, July 6, 1981, pp. 20–21.

Herndon, James, as interviewed on "Patents" by J. Kamenetz, Hamilton Standard, Windsor Locks, CT, 5 PM, July 20, 1981.

Kern, Christopher, "Washington Tackles the Software Problem," *Byte*, Vol. 6, No. 5, May 1981, pp. 128–130, 134–138.

Kuhn, Janet K., and Ball, Leslie D., "Protecting Software with Copyrights, Patents and Trade Secrets," *Journal of Systems Management*, December 1978, pp. 28–31.

Lorr, Richard, "Copyright, Computers and Compulsory Licensing," *Rutgers Journal of Computers and Law*, Vol. 5, 1975, pp. 149–169.

Morgan, Chris, "How Can We Stop Software Piracy," *Byte*, Vol. 6, No. 5, May 1981, pp. 6, 10.

Novick, Harold L., "Copyright Infringement Versus Permissible Use," *Creative Computing*, Jan. 1980, pp. 152–153.

Novick, Harold L., "Software Patents," *Creative Computing*, March 1980, pp. 164–165.

Novick, Harold L., "Software Legal Forum," *Creative Computing*, May 1980, pp. 174–175.

Novick, Harold L., "Software Legal Forum," *Creative Computing*, July 1980, pp. 144–145.

Novick, Harold L., "Software Legal Forum," *Creative Computing*, October 1980, pp. 160–161.

Novick, Harold L., "Software Legal Forum," *Creative Computing*, February 1981, pp. 152–153.

Nycum, Susan Hubbell, "Legal Protection for Computer Programs," *Computer/Law Journal*, Vol. 1, Fall 1978, pp. 1–83.

Roberts, John T., "The Current Law of Patents for Computer Software: Or Benson Revisited," *Computer/Law Journal*, Vol. 1, 1978, pp. 85–104.

Shoor, Rita, "Users Cautioned on Extent of Trade Secret Law," *Computer World*, Nov. 24, 1980, p. 15.

Soltysinski, Stanislaw J., "Computer Programs and Patent Laws: A Comparative Study," *Rutgers Journal of Computers and the Law*, Vol. 3, 1973, pp. 1–82.

Wolk, Stuart R., "Patent and Procurement Law for Engineers and Managers," a course offered by the Hartford Graduate Center, Summer 1981.

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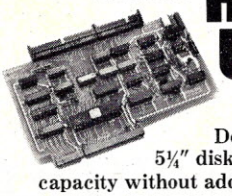

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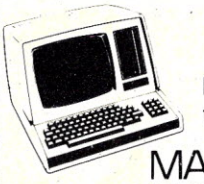

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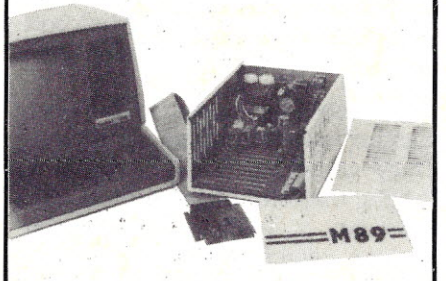

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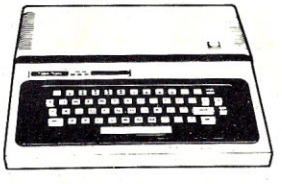

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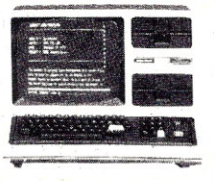

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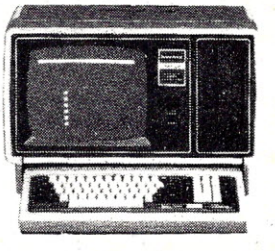

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Piracy—A Serious Threat Or Unfounded Fear?

While those knowledgeable in the field all agree that software theft exists, experts disagree on the seriousness of this offense.

By Bill Grout

The fear of pervasive software piracy may arise in part from a guilty conscience.

Take the programmer who works hard putting together a computer program that will make him or her a lot of money. After devoting hours to getting the bugs out, that programmer puts a copy of the software and the documentation into an envelope—and then has second thoughts while licking the stamp.

"Will this software publisher steal my program and leave me out in the cold?" our programmer wonders. And often as not, the programmer need only look around at his or her own software library to be convinced that software piracy does go on.

At the first conference on software protection in the United Kingdom, Julian Allason, a retired software dealer, flippantly proclaimed in his opening remarks, "If I were to start again in the software business, I would be a pirate!" The crowd laughed knowingly.

Everyone knows it's often disturbingly easy to copy, and thus steal, a computer program. Addressing this same conference, a self-proclaimed software pirate asked everyone who had never made an illicit copy of a program to raise a hand. The hands raised in the entire audience numbered less than five.

Without some kind of protection written into the program, making a copy is the easiest thing in the world. And if the program *is* protected, software wizards may especially enjoy making a copy.

Presently, most people are only guessing as to the amount of software piracy going on. Some would hold that the majority of software theft is done on a friendly basis—one amateur copies a favorite program and hands it over to an interested colleague. A survey of PET computer users in the United Kingdom found that for every copy bought, two and a half were stolen. Yet it's common in the industry to find executives quoting the ratio as one purchased for every ten stolen.

Wayne Green, publisher of this and several other magazines, and founder of Instant Software, has a standing offer of $10,000 for information that will convict a software thief. That would seem temptation enough to turn one's eyes on an unsuspecting friend and pirate. Moreover, it underlines the seriousness with which many take this problem.

But how serious is the piracy problem? Should the programmer, about to submit that first software jewel, fear that the software publishing house will make a copy and develop the program without the programmer? Is dishonesty, as Julian Allason jested, the most profitable policy when it comes to software?

According to Christopher Kern's article on the piracy problem, the relative economic significance of software theft by hobbyists is fairly small. The real problem lies with the large-scale pirate who duplicates programs on a commercial basis. But large companies, like Atari, whose revenues are aligned with computer game products and whose products are more susceptible to theft by hobbyists, may disagree. Who are the pirates one should be concerned with anyway?

Three Categories of Pirate

"I think the types of software pirate fit into three categories," said Ken Klein, chief executive officer of Stoneware Microcomputer Products, producer of the popular database manager, DB Master.

"You have the guy out there who duplicates your product and sells it for 50 bucks. That's the guy I find most odious because he is stealing in every sense of the word."

Klein doesn't feel this kind of pirate is a software dealer, but is more likely a peripheral person who has good technical knowledge and can get into the programs.

"Those are the guys I put on the top of the list to throw in jail," said Klein. "The next group of pirates is probably to be found in the computer clubs. I don't want to cast aspersions on all the clubs. Some of them carry out worthwhile functions, and I have no problems at all with them. But there are certain clubs whose main function is to buy one program and

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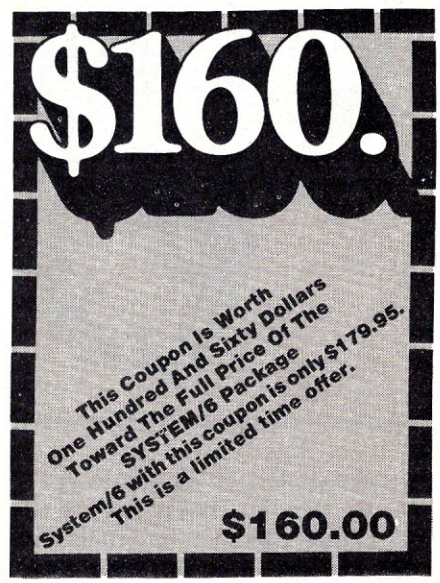

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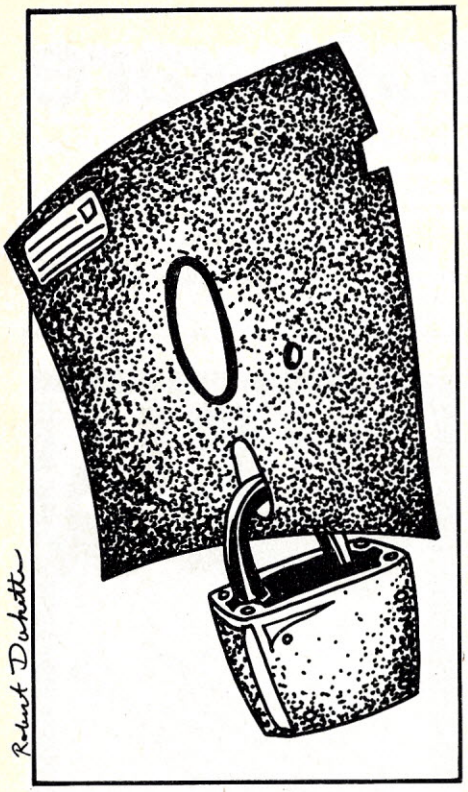

then distribute it to all members.

"A programmer has to make a certain amount of money in order to exist as a programmer full time. Every time a copy of a program he has written is stolen, it means there is less of a chance that he will get his reward, his money. And if he can't make a living at writing programs, he's going to do something else. The long-term implication of that is fewer programs. Solutions for really important problems we have in our society may not be developed."

Klein explained that a single program, DB Master, took five man years of effort to create. He emphasized this as an enormous effort to lose the profits from. "The software pirate does not have the salaries of 30 employees and the overhead of running a business to consider," added Klein.

Klein classifies the people who duplicate copies of programs and give them away to friends as a third category of pirate.

"I don't have a big quarrel with that guy. I can understand his motivation—he's just trying to be a nice guy. It's very common. If I could turn to the guy and say, 'Hey, that's not right, you shouldn't do that,' he would probably stop. These people aren't trying to make money. They're just trying to help out a friend."

When I asked Klein if he had seen a lot of software piracy, he responded that he had seen some, but not a lot. Many dealers feel there is only nebulous information about the amount of piracy that goes on in the microcomputer industry today.

Do Pirates Abound?

"I don't know that I've ever talked to a software pirate," says Doug Carlston of Broderbund Software, developer of Apple Panic. "I'm sure piracy exists, but I'm the last person a pirate would come to to talk about it.

"It's a vague area for a lot of people. They consider the dissemination of information, the sharing of information, a virtue. You'll find that most of our published authors, if they're honest about it, would have to admit to having copyrighted material that they didn't pay for in their personal libraries. I think that's true everywhere."

Carlston doubts if a software pirate can really make a lot of money.

"How's he going to sell his product? Word of mouth, run around with stuff in the trunk of his car? I don't believe dealers do that. I know there are dealers who occasionally run off copies of games to give away as an inducement with computers that they sell. But that's unusual.

"The dealers are trying to sell wares. Hardware was once the primary product of most dealers; but most dealers with foresight now see software as increasingly important. To the extent that they support piracy, they undercut themselves.

"It's entirely possible that dealers do pirate programs. I've heard rumors of large corporations where piracy is endemic, just a joke among the employees who pass a program around to 1500 other emloyees. We have people who buy a payroll program and use it in 195 locations. They didn't buy 195 copies. That may be increasingly the case."

Asked if a software publishing house would covertly copy a program and then develop it without the programmer's knowledge, Carlston replied with a firm "no." He reasoned that there is a very effective grapevine among computer programmers and user groups. Carlston felt that once the word got out that a publisher was stealing new authors' software, that publisher would be out of business in no time at all.

"I don't think stores and distributors would touch pirated products. If somebody came out with another Starblazer and said he'd written it and it was wholly original, he wouldn't get it into the stores. The retailers and distributors would be very uncomfortable; they'd call us a dozen times and ask, 'What on earth is going on?' "

When asked why distributors would hesitate to handle pirated copies, Carlston replied, "Potentially there's liability. When Atari went after all these people for the Pac Man game, they didn't just approach the software house; they approached everybody up and down the chain—a program retailer in Washington, DC, some mail order warehouses, some distributors. They said, 'We're going to get you all.'

"Basically I don't think piracy is a problem. I don't see much sign of it. If a programmer is worried, we'll sign a nondisclosure agreement. We try to keep everything secure. We lock the programs up at night."

Carlston cautioned that occasionally a programmer sends a dozen unprotected copies out to friends for review. To the programmer's surprise, a week later there are copies all over the country. Carlston emphasized that the effectiveness of the grapevine should never be underestimated.

Carlston is one of many software publishers who expressed concern that piracy could damage a publisher's reputation. Besides the difficulties of distributing pirated products, the hint of piracy could have the effect of drying up program submissions to a publishing house.

Is Software Protected by Law?

There seems to be a consensus among people in the microcomputer industry that software is protected by law, but not by the legal system.

Court cases concerning the copyright of computer programs have in general disfavored the pirate; however, the amount of capital needed to pursue a copyright infringement makes recourse to the legal system only marginally profitable. All too often the compensation for damages falls dismally below the legal fees incurred.

Irwin Taranto, of Taranto and Associates, Inc., a software publisher specializing in business software and support services, commented on the legal dilemma.

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$50,000 to save $5. The legal system isn't up to handling it. I've got ten people I could sue. I *did* sue one. It cost me $20,000 to pursue the case. I received $1000 in reparations. Whoopee! If I had proceeded any further it would have cost me $50,000—this way I stopped it at $20,000. So we do pursue legal solutions; we use our attorneys to write nasty letters. But on a practical basis it's tough."

Taranto added, however, that there has never been any form of protection written into his programs. He stated that this arose mainly from his philosophy about selling software.

"I'm in the business business. I sell business systems, not games. I sell the fact that a customer can call me at any time and get the support he needs to keep him in operation. Regardless of what his problem is, he can come in here or call on the phone.

"When someone makes a copy and gives it to a friend, no, I don't like it. But he doesn't bother me because the person who gets it is dumb. And the person who gives it is dumb. Let me tell you why.

"If I find out that a customer has given away my program, I will never talk to him again. So he's lost my support, and loses 90 percent of the value of my program. Secondly, the person who buys it can't call up and get the support. So if it took you five, six, ten hours to solve a problem on your own, then you've used up more in the value of your time than the cost of the program to begin with.

"Generally, we don't find our customers giving the program away. They will show it, they will demonstrate it, but when someone is ready to go into operation, he comes to me. You can steal my software, but you can't steal my support.

"I believe that if you make your program useful to customers, your customers will want to see that you stay in business."

Fighting Them Off

Taranto's strategy against software piracy is inducement—claiming that the original producer of the software can best support it. Numerous other countermeasures are considered by software publishing houses.

Outside of actually bringing suit, the legal system can wield embarrassment as one means of deterring pirates. In the case of B.B. Roberts, a self-proclaimed software pirate working out of Las Vegas, Atari hired a detective. In three days they had tracked B.B. Roberts down and prevailed on him to write an essay published under the title "Yo! Ho! Ho! And a Bottle of Trouble!"

Other alternatives include visible and invisible trademarks, execute-only ROM, and electronic black boxes designed to lock the prying pirate out.

Yet many software developers seem to have more faith in the technical genius of the pirates than in any protection system they might devise.

Jim Ayers, a computer consultant and programmer in Mill Valley, CA, commented on methods of software protection.

"These protection schemes are ridiculous," said Ayers. Ayers told of a talented young programmer who was a member of Apple Core (a San Francisco Apple computer user's club). Ayers said that the young man had written a nibble copy program that he intended to give to the Apple Core library. Some people see nibble

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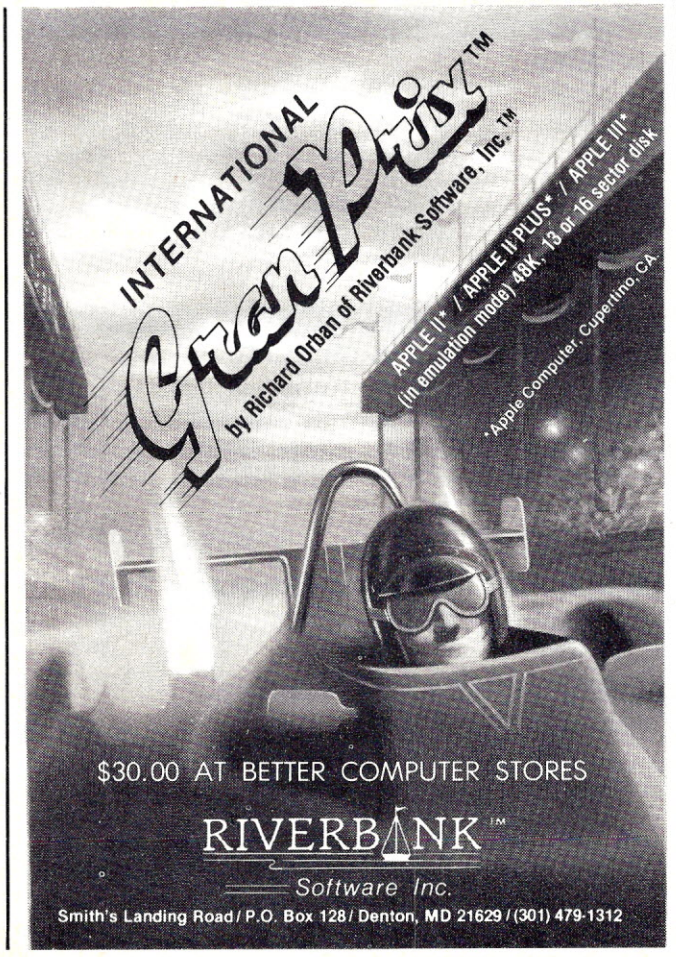

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copy programs as primarily a piracy tool devised to illicitly copy protected programs.

Ayers went on to explain that the young programmer's offer nearly broke up the club. Members of the user's group claimed that, had they accepted the program in their library, the club would be condoning piracy. By the time the voting to accept or reject the program was finished, all the officers of the club had threatened to resign, and the international branch of the club was preparing to drop the club's charter.

"Then one of the local software houses came to me and said they needed a programmer. I suggested they use this kid. I told them they should give him a chance to do something of value, so he wouldn't have time to write this copy program that they're so afraid of." But they declined.

Ayers' point is that many people have the skill to crack program protection systems and therefore money devoted to developing these systems may be wasted.

"It (piracy) is going to happen, I'm afraid. There's no foolproof method of protection. But I would hope that the moral fiber of the nation is not so deeply frayed that we can't depend on honesty."

All too often
the compensation for
damages falls dismally
below the legal fees incurred.

Many software publishers agree. Of those publishers interviewed, most felt safe relying on the basic honesty of their customers. None felt that their businesses were threatened by piracy. Publishers selling business applications programs expressed faith that the average businessman wasn't interested in pirated copies of programs. The publishers believed that businessmen would buy software from legitimate dealers rather than jeopardize their business over the price of a pirated copy.

Ayers added that he had known of one computer business which seemed to pirate software. All their customers had the same serial number on their operating systems, and they all received photocopied manuals and documentation. Ayers said that at one point the pirate had apparently even sold the same computer twice. Then his wrongdoing caught up with him. "He went out of business," said Ayers.

How Can a Programmer Get Protection?

A California lawyer versed in the issues of software copyright laws (and who did not wish to be named) stated that software authors do have some protection against unscrupulous publishers.

"Software is protected as much as anything else. He (the programmer) is protected just as much as someone who writes a book. There's nothing to stop you from copying a program except the law, the same law that stops you from taking a book to the Xerox machine and copying it. That's the same problem.

"The programmers' unease comes from two areas. On one side, the government does not enforce the

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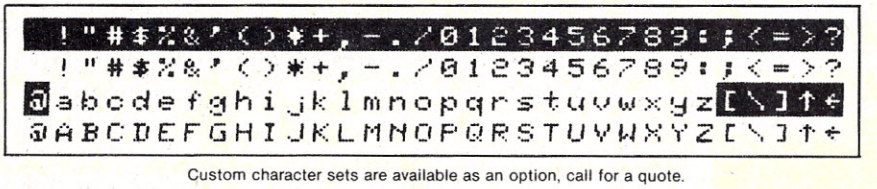

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law—the programmer has to do that him or herself.

"On the other, we have pirates, and people see their stuff being ripped off and they haven't factored in the amount of reserve necessary to absorb those losses.

"Before the 1978 copyright act, the publishers of small professional magazines were really hurting because of photocopying. It's exactly the same now with software. You can't prevent copying of software unless you encode it in such a fashion that no one can get at it, in which case it's debatable whether you can get it copyrighted, because nobody else can read it either to see if it's been infringed.

"The copyright law existed in that form for years. There was nothing to prevent any pianist in any bar from playing somebody else's music, and yet that infringed the copyright. Then an organization called ASCAP (American Society of Composers, Authors, and Publishers) made it their business, with paid employees, to monitor the bars and saloons and anyplace else to make sure the annual license fee was paid."

The attorney favored creating a parallel situation in the software industry. Major distributors, dealers and clubs could be monitored to guard against copyright infringements.

"This is the time to do it, while the industry is still young. If it gets too big, everybody will regard it as perfectly all right to copy software. I suspect club members may even now be apprehensive—may feel that they are not being exactly honest. A few visitors monitoring these clubs, watching software being copied and writing nasty letters to the miscreants, would say 'Hey! Somebody's watching you!' This is private industry protecting itself."

To ensure protection from a legal standpoint, all the programmer has to do is register the program with the copyright office. The forms are free and uncomplicated, and the registration fee is $10. The applicant must include two copies of the program listing (some say you need only include the first and last ten pages of the object code) and then he will have established *prima facie* evidence that the program is his. If the programmer can prove that another program has the same listing, the court will grant an injunction.

In Tujunga, CA, a new group has formed to help fight software piracy. The Association for Software Protection (ASP) is a non-profit organization whose principal aims are to educate end-users about the legal aspects of software transactions and to ensure ethical practices within the industry.

Robin Robinson, President of ASP, estimated that only five percent of software thefts were intentionally dishonest. She felt the majority of proprietary violations occurred due to ignorance of the unique nature of computer software. The members of ASP hope to dispel the public's misconceptions surrounding software licensing agreements. Robinson also sees ASP as possibly introducing software protections to its members and helping them create a marketplace barred to the blackmarketeer.

As advice to new programmers, Robinson suggested that the programmer obtain a nondisclosure agreement from a publisher before handing over any code. Then, if a contract is offered, the programmer should consult an attorney about the license agreement.

There should also be some arrangement made to monitor the publisher who handles distribution of the program. Robinson said that, although using an attorney may seem an expensive precaution, it could save programmers their livelihood.

In Your Heart, Are You a Pirate?

Robinson's estimate that only five percent of program thefts are committed with intent leaves one wondering if piracy is as large an issue in the software industry as some would make it out. It is likely that estimates rise or fall proportionate to the estimator's fear of pirates. Program authors and publishers are quick to claim that piracy exists, but few see it as threatening in the long run to reputable businesses. The filching that goes on among hobbyists and buddies doesn't overly concern many software producers.

Software publishers I've talked with are sincere about safeguarding the submissions of aspiring programmers, perhaps because they readily identify with the uncertainty of the new programmer, seeing in it their own uncertainties of not long past. Advice offered time and again is that the programmer should only submit to those software publishers with good reputations. But in general, publishers felt new programmers had no great reason to fear.■

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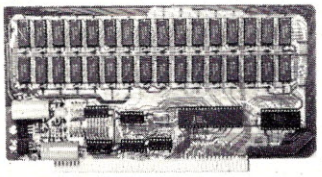

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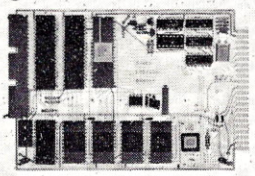

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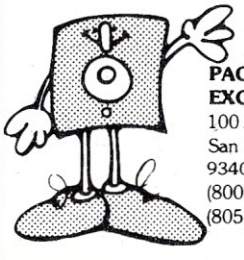

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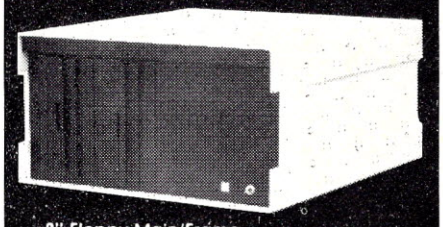

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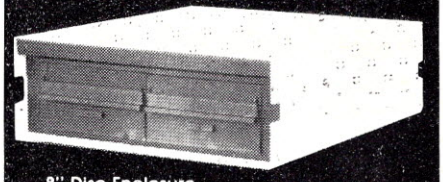

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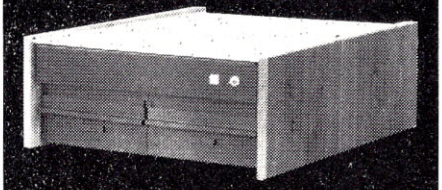

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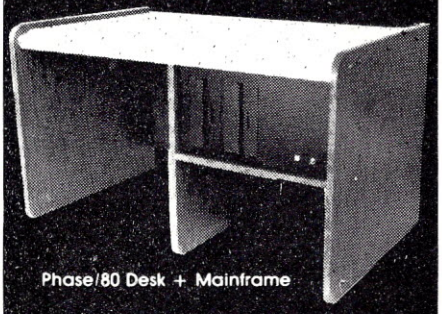

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Attaché Computing

Panasonic's computer system gives you portable computing power in an attache case. The system includes a handheld computer, RS-232C interface, modem, printer and external RAM module.

By Elliott S. Kanter

You can expect two qualities from a new computer: it will be smaller, and it will be more powerful and versatile. Unfortunately, as computers shrink the hype increases. A smart pocket calculator becomes a pocket computer and the company promises add-ons that rarely come.

Panasonic's RL-H1000 handheld computer and computer system is an exception. The specifications and available options are just that—specified and available now!

The entire concept of the portable, pocket-sized computer is good. The catch is, if I carry my system in my pocket or attache case, what features do I leave behind in my office? With the RL-H1000, the answer is simple and direct—nothing. Everything is portable and part of a well-conceived and executed system (see Photo 1).

Imagine an attache case with the following:

- a computer
- an RS-232C interface
- a modem
- a printer
- an external memory (with battery-backup)
- video and TV ports
- I/O expansion interface
- an ac/dc operation providing uninterruptible power

The basic handheld computer (see Photo 2) is available in two configurations. The 1000 has 2K bytes of programmable random-access memory (RAM) and the 1400 features 4K RAM in the computer. Other than the amount of available RAM, the two models are the same. The computer measures 8 5/16 by 1 3/16 by 3¾ inches and weighs just under one pound. Operating power is supplied by internal rechargeable nickel-cadmium batteries or via an external 120 or 220 V ac supply. The ac supply will operate the computer and all accessories as well as place a floating charge on internal batteries.

The microprocessor is the tried-and-true 6502 running at 1.048 MHz. An internal read-only memory (ROM) of 16K bytes is standard. Three additional sockets for "snapsules" (user installable ROM chips)

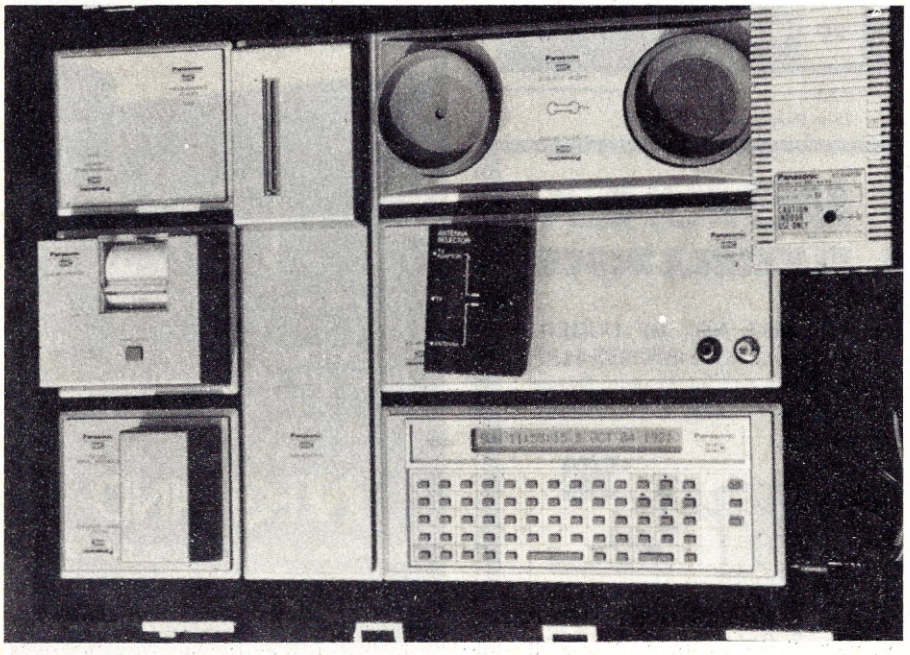

Photo 1. The complete RL-H computer system with all available peripherals in the attache case. The system includes the computer, RS-232C interface, acoustic modem, printer and external RAM module and is available from Panasonic, One Panasonic Way, Seacaucus, NJ 07094.

Address correspondence to Elliott S. Kanter, 1704 Raleigh Ave., Holly Hill, FL 32017.

let you add up to 48K ROM. The internal RAM can address and control external RAM banks of up to 16K bytes each. All data residing in the internal RAM is protected by the combination of the ac supply and internal batteries. Any interruptions of normal power will cause the unit to immediately revert to battery operation.

The keyboard is laid out in the conventional QWERTY fashion with 65 positive-action keys that are user-redefinable. It's surprising, at least to someone with fat fingers, just how easy the keyboard is to use. With just a little practice, I found I could touch-type, despite what appears at first glance to be a compact and crowded keyboard. Certain keys are specified and reservable for use as functions, codes and passwords.

The display is novel and easy to read. It features a continuous, low-persistence liquid-crystal display of 8 by 159 dots. A total of eight "blip" dots above corresponding attention-getters on the panel alert you to modes and specific conditions that could, like the low battery indicator, alert you to problems. The display will scroll on command to permit additional portions of the display to become visible, much like the moving billboards. You can adjust the speed of the display, stop it entirely or reverse it with a simple command.

The handheld computer contains its own internal nickel-cadmium batteries with a specified requirement for a 12-hour initial charge. However, the system can be fully operational if the ac supply is in use, regardless of the condition of the internal batteries. The system features a 44-pin edge connector for attaching peripherals.

The compact thermal printer can be used directly with the computer. No special interface connection is necessary as is the case if you use only *one* peripheral at a time with the computer. The printer interfaces directly to the computer through the 44-pin connector or via an I/O adapter interface.

The printer is accessed and addressed with the proper selection of printer on the main computer's input/output menu. Once on, it will faithfully print all information on its 1½-inch wide paper. Like the computer, it will print both upper- and lowercase, but alas, true descenders are missing.

The printer uses 5 by 7 dot matrix with 15 character columns per line.

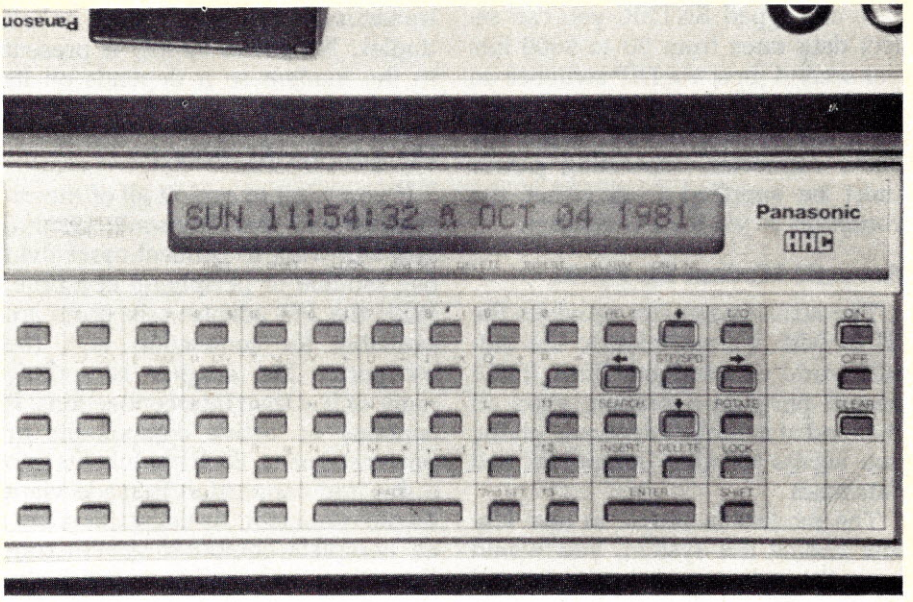

Photo 2. The RL-H1000/1400 computer displaying time and date information.

Full alphanumeric character sets are available, with a variety of symbols also reproducible. Character spacing is 13 characters per inch and line spacing is eight lines per inch. For simplicity, friction paper feed with no reverse is used. However, there is a paper feed button. The paper is standard 38 mm thermal, cored, with about 2200 lines of print possible per roll. The thermal print head is specified to print 500,000 lines (some 220 rolls of paper) before it will need replacing.

The compact printer measures about 4½ by 3¾ by 2½ inches and weighs about a pound, including its batteries. Fully charged batteries should support up to 1½ hours of continuous printing. However, if you use the ac supply, only the amount of paper available will limit your printing. Print quality, despite the small size, is rather good, and the speed of 1.5 lines per second is acceptable when you consider that the Micro Printer can print a 250 word page in about 100 seconds.

TV Adapter RL-P2001

The TV/video adapter lets you use either a TV (channels 3 or 4) or a dedicated monitor. User selection of the rf output will let you select a channel not in use in your area. A small adapter box allows quick and easy connections between the computer and the television set. Unlike most of these "stunt-boxes," the Panasonic engineering staff used F connectors for all interconnections. According to Dennis Reer, Panasonic's Chief Project Engineer, these connectors made it possible to achieve a significant reliability factor and reduce potential interference, which is being regulated at present by the FCC. These are the same connectors used in a variety of cable TV systems, and most TVs already have an available F connector. Cables with F connectors at both ends are supplied.

According to published specifications and user trials, the display is 16 lines of 32 characters (512 characters) with characters formed by a 5 by 7 dot matrix. Both uppercase and lowercase letters, numerics and symbols are displayed. When the display exceeds 16 lines, each line moves up and the 17th line becomes the new 16th line.

As tested, the graphics package did not have color graphics; however, separate snapsules let you buy the graphics capabilities you require for your applications. With these easy to install snapsules, you won't be forced to buy features you don't want.

RS-232C Serial Interface RL-P3001

The serial interface together with an appropriate cable will let you connect the RL-H system to a variety of peripherals. The module fits into the computer's 44-pin connector or can be used with the I/O adapter. When using the interface, you'll see a prompt on the menu asking how you wish to configure your interface. You can choose character code lengths of five, six, seven or eight data bits with one or two stop bits and odd, even or no parity.

After you've configured your inter-

face and typed ENTER, you can select data rates from 50 to 9600 bits per second (bps) via DIP switches on the bottom of the module. Connections are via a standard 25-pin RS-232C connector. Operating power must be supplied from either the computer or via the I/O adapter.

Acoustic Modem RL-P4001

The acoustic modem provides the RL-H with a connection to the outside world via telephone lines. It will permit portable operation, even on the road at a public telephone, giving you access to other computers and databases.

The modem is simple to use. Unless testing the system, you would keep the only switch in the normal position. The modem can be connected either through the I/O adapter or directly to the handheld computer. With the modem connected you have a high-speed data-transfer system whose speed equals the sending or receiving of a 250-word typewritten page in about five seconds. The snapsule furnished with the modem allows you to send and receive at either 110 or 300 bps. Asynchronous serial transmission can be either full or half duplex. No power supply is present in the modem so it depends on its host for power.

I/O Adapter RL-P6001

If you want to exploit all of the capabilities of the Panasonic system, you will want to connect more than one module or peripheral at a time. With the I/O adapter, six ports are available for connection with the computer. The adapter is nothing more or less than interconnections. It contains no active components or power supplies. Each module fits into a slot and connection is made via a 44-pin connector. By using this adapter, complete computer system configurations are possible and each slot is identified on the computer's I/O menu as to device, slot number and condition (e.g., on/off). No slots are dedicated and the current position is reported via menu.

External Programmable RAM RL-P9001

Panasonic offers expandable memory, now available in 4K or 8K increments. Available memory is reported via the I/O menu. Up to six modules could be used with the I/O adapter for potential of 24K bytes of RAM. Each RAM module has its own battery backup to prevent loss of stored data.

According to the manufacturer, three non-rechargeable AAA batteries will provide up to one year of fail-safe backup. Future plans call for additional and more concentrated RAM modules as well as mass storage on a miniature floppy disk system, but the 4K or 8K RAM modules are available now.

Nitty-Gritty User Overview

As a relative newcomer to computing, I wasn't prepared for all this compact system had to offer. I wasn't prepared for one that was user-oriented and idiot-proof. Many people hesitate to take on a new technology. There is no trace of intimidation with the Panasonic system. It was designed from the ground up with the novice in mind. As you are ready to take on new and more complex functions, the computer is ready to talk and prompt you through them. For that matter, Panasonic could say that the RL-H is ready when you are, and not be stretching a point.

When you first turn the computer on, a menu appears that permits you to use the system as a secretary, appointment book, time keeper, address book and file system. "Fine," you might say, "but how hard is it to use?" Let's look at files.

The computer asks you to select a name for your file; you do and call it MY FILE. The computer accepts this and you begin to enter into your file, in any way, manner, shape or form. Just don't exceed the 80 characters per line. Your file is in memory; you can use the search to locate objects and data with lightning speed, and you can add, delete or modify at will. You can also write programs in plain Microsoft Basic, and you address your file or program as MY PROGRAM.BAS. The .BAS tells the computer that this is a program rather than a simple file.

But the fun is only beginning. You plug the computer into the I/O adapter with a few of your favorite peripherals and you find that the basic menu now tells you that you can telecompute and typewrite. The latter is supported by a rudimentary word processing program with the ability to delete, move, add and do many of the functions that only a more expensive and obviously larger system would be capable of doing.

If you buy the first system someone offers, you usually expect less than terrific support materials, quick smudgy print jobs or no manual at all. Not the case with Panasonic. The manual is small and loose-leaf. Changes, improvements and enhancements reach you in a simple business envelope for replacement of pages, not forcing you to wait for the reprints of an entire manual. The earliest versions of the manual do have some rough edges—they seem to lose something in the translations—but again, according to Dennis Reer of Panasonic, updates and improvements are coming on a daily basis.

In a nutshell, I sat down and asked myself, who would use this system and where? I found myself with an infinite number of possibilities. It's definitely a serious computer, with a fine assortment of available peripherals. I see it as an adjunct to medicine, I see it on the road, and I see it in homes, schools and offices. What I don't see is anyone using it for games.

Some years ago, Panasonic's advertising logo was "Slightly ahead of our time." With the RL-H Computer System, those words couldn't be more true.■

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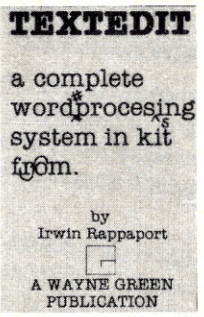

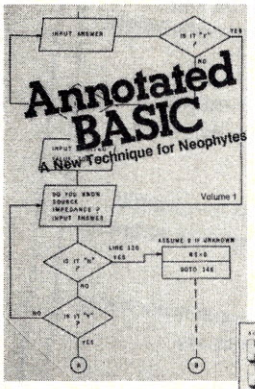

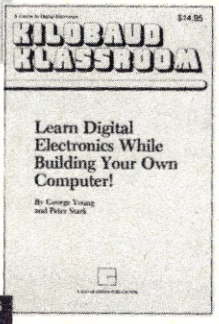

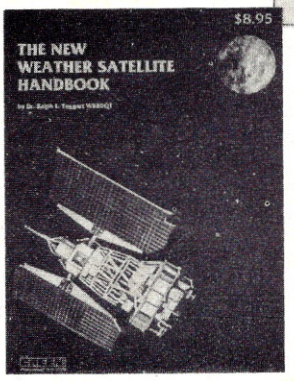

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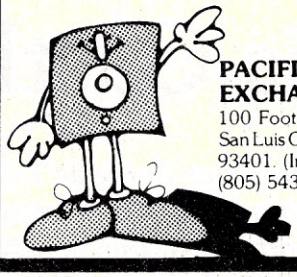

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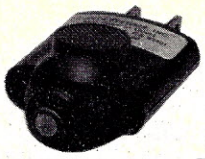

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A Computerized Man's Home Is His Castle

Now every computer hobbyist's dream of computerized home control can become a reality with the advent of inexpensive microprocessors coupled with BSR modules.

By Bobby A. Jones

I wanted computerized control of my home, yet I didn't want to tie up my home computer. So I built a stand-alone computerized home controller using BSR control modules and an Intel 8085 CPU.

The BSR modules are the backbone of this controller; they're inexpensive (less than $15 per module) and they use existing house wiring. The home controller is coupled to the BSR command module via an ultrasonic link.

A tabletop-sized chassis holds the hardware and software. You need no special knowledge of hardware or software to either build or operate this unit.

The controller can control up to 16 modules. They can be turned on or off, or, in the case of lights, can be dimmed or brightened. (See Table 1 for a reference sheet.)

The controller can handle 50 events. An event consists of a function, a day, a time and a module number. For example, one event might be "turn on module 5 Saturday and Sunday at 14:30." Another event would turn the module off. Table 2 is an example of the events I use to control my home.

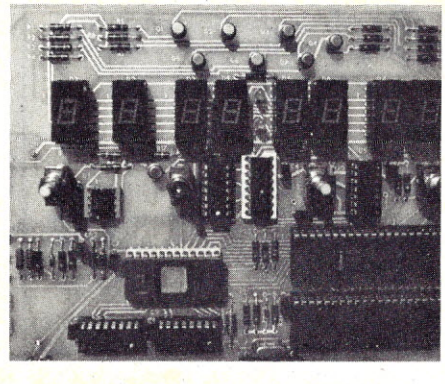
A few special-event programming cases are worth noting. The "null" day is used to mark an event inactive, so you don't have to erase the whole event. The function and day codes marked N/U are not used at this time. Some simple error-checking is done in the software to ensure the events you program in RAM are valid. If an error in programming occurs, an error message is displayed with the location of the invalid event; an error in event 10 would read as EE 10. The software initiates this error-checking when the mode switch is returned to run mode.

The Circuit

I tried to minimize hardware wherever possible and use software in-

	Functions			Day	
Off	0		Null	0	Null is used to
On	1		Sun	1	mark an event
All lights on	2		Mon	2	inactive
All off	3		Tue	3	
Dim 20%	4	The dim and	Wed	4	
Dim 40%	5	bright functions	Thr	5	
Dim 60%	6	will turn a	Fri	6	
Dim 80%	7	module on if	Sat	7	
Bright 20%	8	it wasn't	Everyday	8	
Bright 40%	9	previously on	M,W,F	9	
Bright 60%	A		Sat, Sun	A	
Bright 80%	B		Mon–Fri	B	
N/U	C	Not used	Tue, Thr	C	
N/U	D	Not used	Mon,Fri	D	
N/U	E	Not used	N/U	E	Not used
N/U	F	Not used	N/U	F	Not used

Table 1. Home Controller program reference.



Component side of the PC card.

Address correspondence to Bobby A. Jones, 5251 Theresa Way, Livermore, CA 94550.

stead. This made the controller less expensive and easier to build. I chose the Intel 8085 because of its built-in interrupt circuitry and its family of available support chips.

The controller consists of only three main ICs (see Fig. 1): the 8085 CPU; the 8156, which has 256 bytes of RAM, 26 I/O lines, and a 14-bit programmable counter timer; and the 2716 EPROM used for program storage. The rest of the integrated circuits are needed for interface and drive. The 74LS175s latch the address bits for the 2716, since the 8085 has a multiplexed data and address bus. The 74LS74 latches the interrupt pulse out of the 8156's timer/counter.

Digit select and drive is done with the NE590. A 555 is used as an oscillator to drive the ultrasonic transducer at 40 kHz. It is controlled via an output line from the 8156. The power supply consists of a 7805 providing 5 V, a 74LS132 providing real-time clock interrupts at 60 Hz, and a diode switching of the nicad battery for power failures.

The schematic for the entire controller is shown in Fig. 2.

Battery backup guards against power failures. During a power failure the real-time clock is kept accurate by the internal crystal-controlled clock connected to the timer located in the 8156. This timer is used normally to refresh the display. Its frequency of oscillation provides for both flickerless digit refresh and precise real-time clock interrupts.

If power fails, the display is blanked to reduce battery drain and stand-by power is obtained from the internal nicad batteries. Any events that should have occurred during a power failure are marked internally by the software and are scheduled for completion when power returns. Therefore, the controller will play catch-up when power returns. The batteries will last several hours and outlast most power failures. When power does return, an "E" is placed in the left-most digit of the display to notify you of a possible error in time or event scheduling. If the power failure was long and the batteries went dead the message DEAD is displayed. The batteries are slowly trickle-charged by an internal resistor, so full battery potential in this instance may be a few hours in coming. The value of the internal battery charging resistor was carefully chosen to prevent overcharge of the nicads.

Software Design

The software for this project is over 40 pages of assembly language, and is much too lengthy to publish. Those interested can buy a copy from the author. I wrote the software in assembly language for speed and to reduce the final code size (it had to fit in one 2K×8 EPROM). I broke the software into modules and structured it as much as possible. I've included a

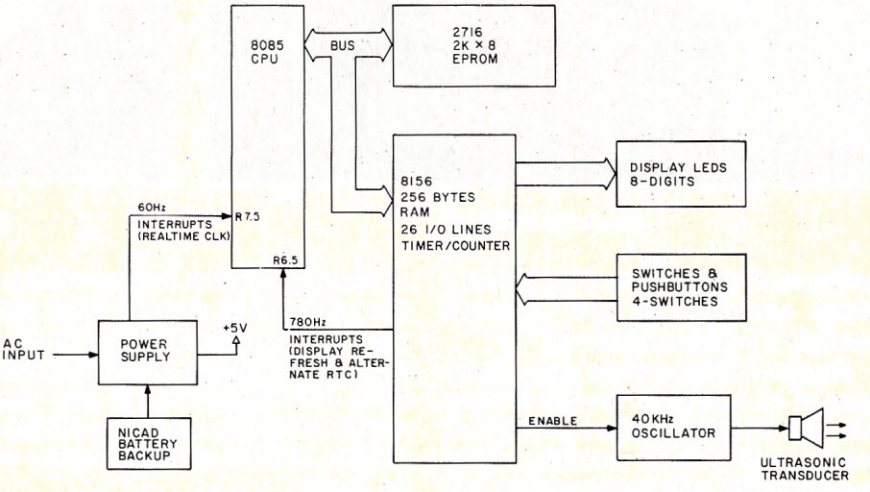
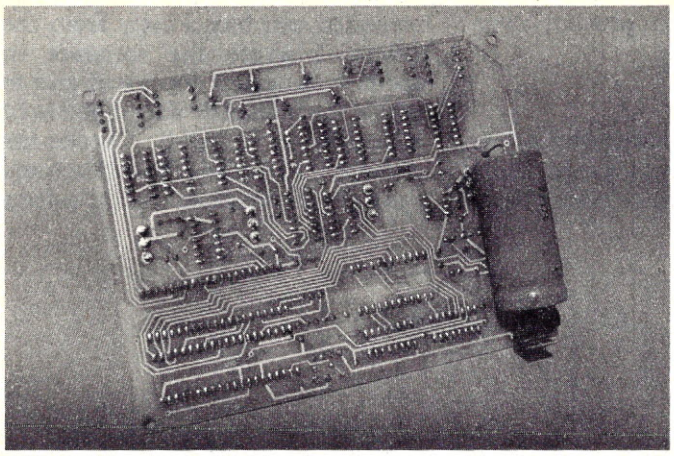


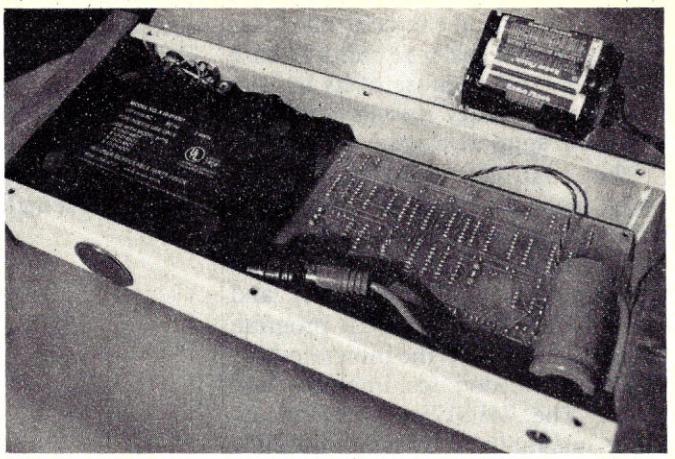
Fig. 1. Controller block diagram.

Resistors	
R1–R7	56 Ohms, 1/4 Watt
R8–R14	3k Ohms, 1/4 Watt
R15	240 Ohms, 1/4 Watt
R16	1.5k Ohms, 1/4 Watt
R17	470 Ohms, 1/4 Watt
R18	Not Used
R19,R23	1k Ohms, 1/4 Watt
R20–R22	10k Ohms, 1/4 Watt
R25–R29	10k Ohms, 1/4 Watt
R24	510 Ohms, 1/4 Watt
R30	100 Ohms, 1/4 Watt
R31	51k Ohms, 1/4 Watt
R32	200 Ohms, 1/4 Watt
Capacitors	
C1	4000 μF, 15 V Electrolytic
C2–C9	.01 μF, 50 V Cerc.
C10	1 μF, 50 V Cerc.
C11–C12	20 pF, 500 V Silver mica
C13	.1 μF, 50 V Cerc.
Transistors	
Q1–Q8	2N2907A, NPN
Integrated Circuits	
U1	NE555 Timer
U2	Not used
U3	SN74LS132
U4	NE590
U5	SN74LS74
U6	2716
U7	8156
U8–U9	SN74LS175
U10	8085
U11	7805, 5 V regulator
Diodes	
CR1,CR4	1N4148
CR2–CR3	1N4001
CR5–CR6	1N270
Miscellaneous Parts	
D1–D8	7-Segment LEDs, HP 5082-7623
LT1-LT2	Yellow LED
UT1	J4-815,Ultrasonic xducer, GC Electronics
X1	4 MHz XTAL
S1,S3	Momentary push button switches
S2	Three position toggle switch
S4	Momentary toggle switch
T1	12.6 V, 2 A xformer, triad F44X
F1	1/2 A slo-blow fuse
B1–B6	1.2 V, AA nicad
1 EA	24 pin socket
2 EA	40 pin sockets
10 EA	14 pin sockets
3 EA	16 pin sockets
1 EA	8 pin sockets
1 EA	Line cord
1 EA	Fuse holder

Parts list.



Bottom side of PC card.



Controller with bottom cover removed.

software flow diagram (Fig. 3) and a short summary of each software module's function (Table 3).

Routines exist to allow easy debugging of all hardware functions when the unit is initially built. I also included tests for RAM memory, front panel display and the ultrasonic link and BSR modules. These test routines are entered when the unit is turned on if the event select switch is depressed. The routine that is entered is dependent upon the setting of the mode switch. If this switch is in the edit position, then the RAM test is run. This test fills the RAM memory with a test pattern and then reads it back for comparison. If they don't match, an error message is displayed (EEEE). If all is well the display will be blank.

If the mode switch is in the run position, the command test is run. This test first sends the command to turn on module 1. After two seconds, the command to turn the module off is sent. If you press the digit select once while this routine is running, the module tested is incremented by one until all 16 modules are tested, after which the test repeats with module 1. If the mode switch is in the time set position, the display test routine is entered. This test fills the display first with all zeros, then increments all displays to all ones, and so on for the 16 possible combinations (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, blank).

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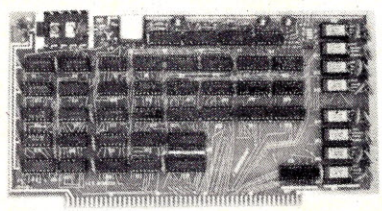

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These three tests will test most of the hardware in the controller; if they all test okay, your assembly is probably accurate. If any errors occur you will at least have a place to start troubleshooting from.

Assembly and Construction

The entire controller is contained on a single printed circuit card to allow for easy assembly (see photos). The 8085, 8156 and 2716 should be installed using sockets. The display LEDs should be mounted on sockets to raise them up to the front panel. The 4000 uF filter capacitor and the 7805 regulator are mounted on the bottom side of the PC board due to the height of these components. I mounted the ultrasonic transducer on the underside of the controller board with a little silicon rubber.

The transducer should be wrapped with tape first so it won't short out against the board's conductors. The nicad batteries were mounted on the inside bottom cover of the controller chassis. Don't hook up the batteries until your final assembly, because you'll need to check out the power-fail features when the battery is dead.

A hole of some type should be provided in the chassis to let you operate

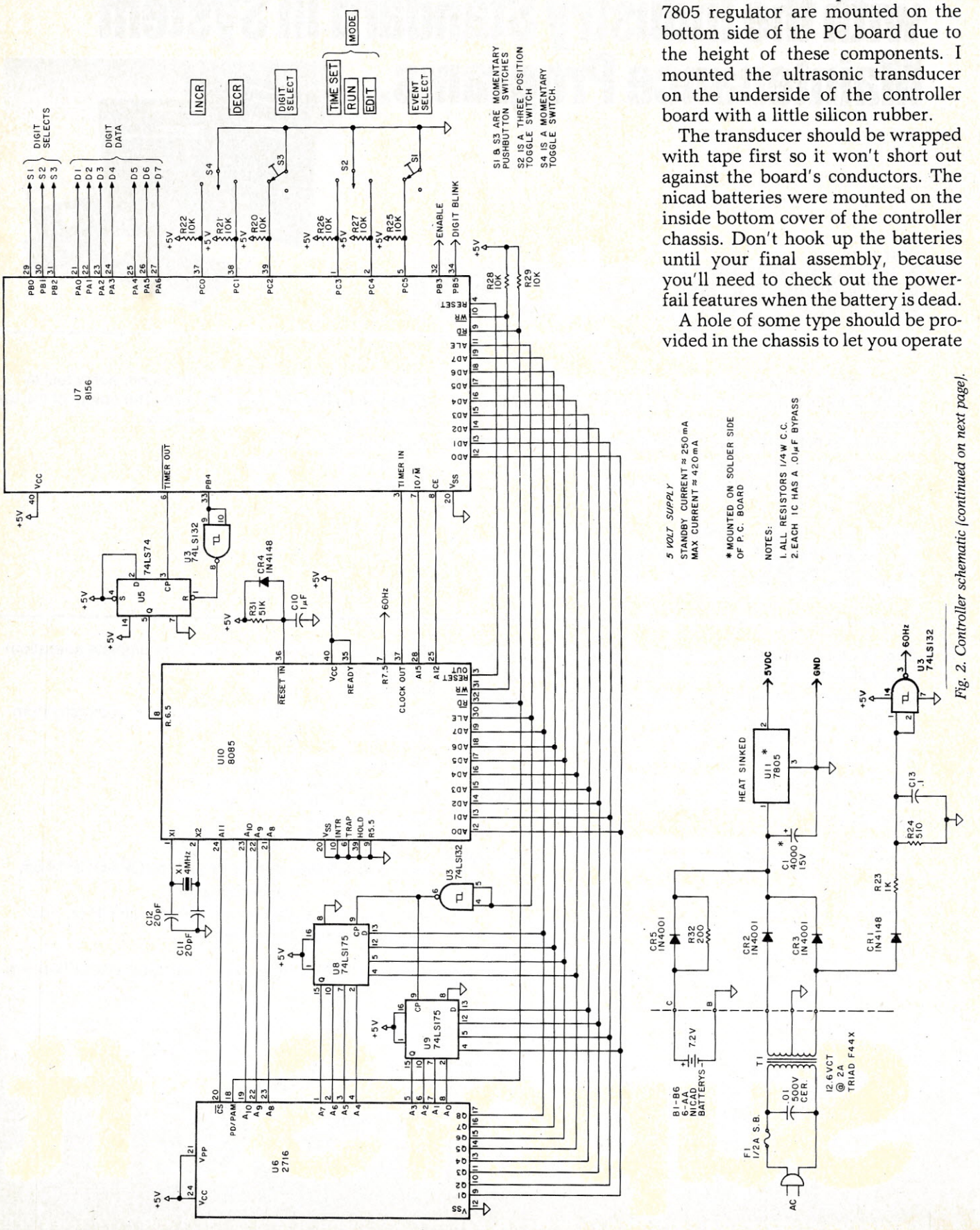


Fig. 2. Controller schematic (continued on next page).

the controller via the handheld ultrasonic controller you can buy. Be sure you buy a BSR command console that is controllable ultrasonically, or nothing will work! I put the power supply transformer in a small enclosure which plugs into an ac outlet. This cut down the size of the tabletop chassis and removed some of the heat generated by the transformer (see Fig. 4 for wiring details). I've included a photo of my unit to give you an idea of how I built my controller. But you may choose to build yours differently.

Function	Day	Time	Module	Location	Notes
1	B	6:30	1	HEAT/AC	MORNING HEAT ON
0	B	7:30	1	HEAT/AC	MORNING HEAT OFF
1	B	16:00	1	HEAT/AC	EVENING HEAT/AC ON
0	8	22:15	1	HEAT/AC	SHUT HEAT/AC OFF
1	A	8:00	1	HEAT/AC	WEEKEND HEAT ON
6	8	17:00	2	LIV. RM. LIGHT	ON AND DIM
0	8	22:30	2	LIV. RM. LIGHT	OFF
5	8	17:30	3	FRONT PORCH LIGHT	ON AND DIM
0	8	22:30	3	FRONT PORCH LIGHT	OFF
1	B	6:00	4	COFFEE POT	ON—WEEKDAYS
0	B	8:00	4	COFFEE POT	OFF
4	8	19:00	5	GROUND LIGHTS	ON AND DIM
0	8	23:00	5	GROUND LIGHTS	OFF
1	9	5:00	6	LAWN SPRINKLER	ON M,W,F
0	9	6:00	6	LAWN SPRINKLER	OFF
5	0	20:00	7	UPSTAIRS LIGHT	AWAY LIGHT
0	0	23:30	7	UPSTAIRS LIGHT	OFF

Table 2. Sample events.

Operation and Programming

The controller's front panel display is made up of eight yellow LEDs (I get so tired of red) and four switches. The four center digits will display the time of day when the unit is normally operating. When you flip the mode switch to time set you're able to set the four digits to the current time of day. The time starts when you set the mode switch back to the run position. The digit select switch is used to select which digit is to be edited, while the increment/decrement switch is used to do the actual editing of digits.

The edit position of the mode switch is used to edit the events in the event buffer.

The first event is edited, then the

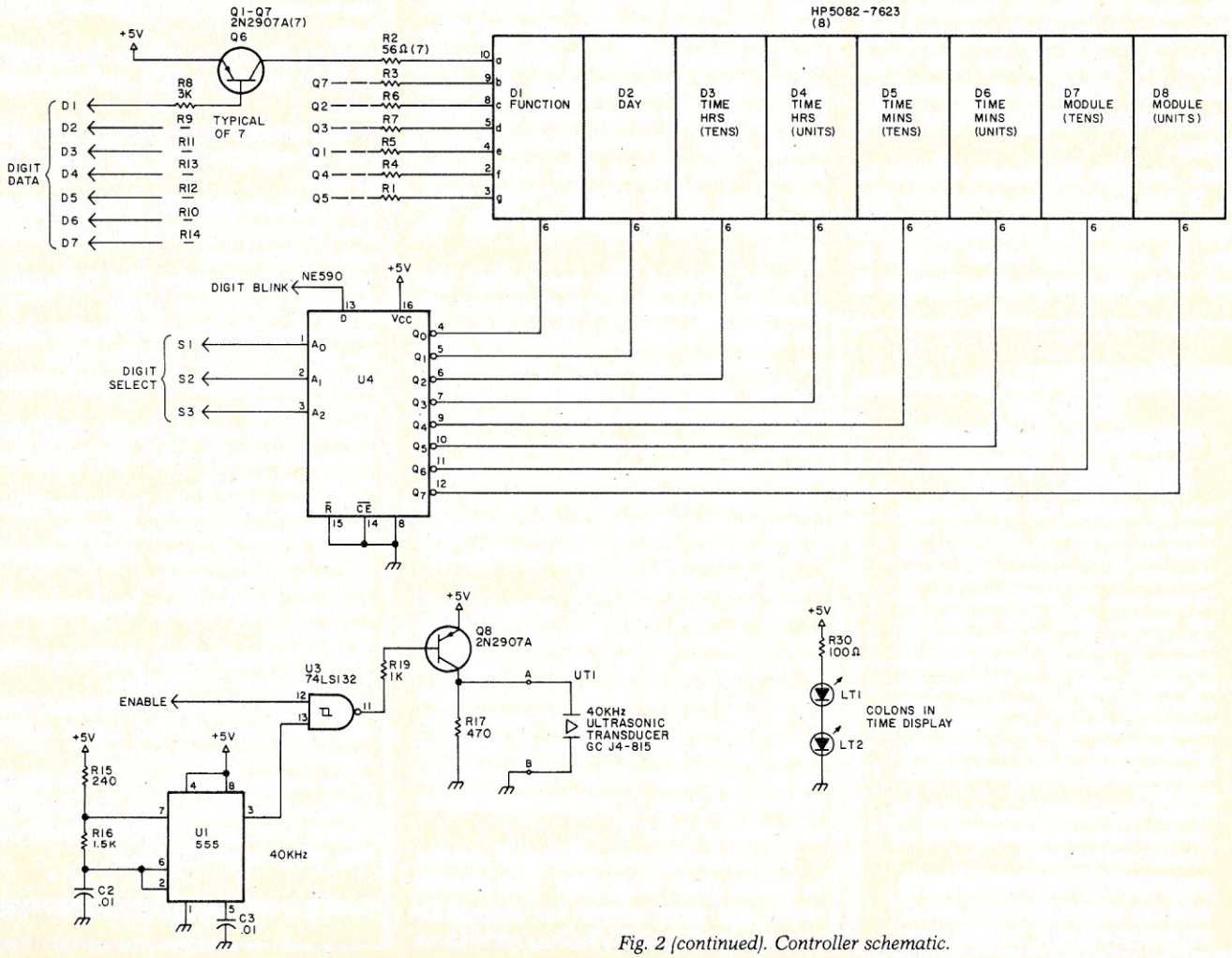
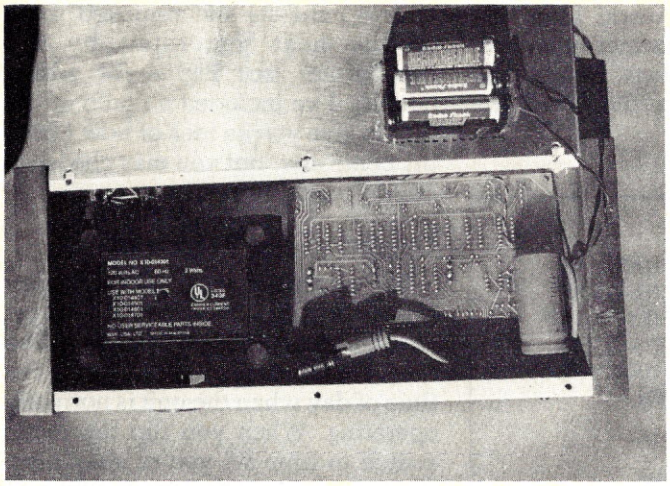
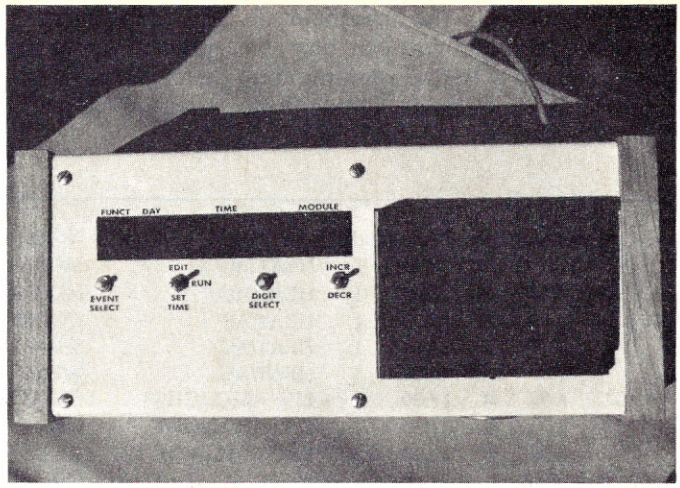


Fig. 2 (continued). Controller schematic.



Inside the controller.



Completed controller unit.

second and so on until all 50 event locations are edited. Of course you don't have to edit each and every event. You can just return the mode switch to run mode and edit mode will be stopped. The event select, digit select and increment/decrement switches work singly if hit once or increment slowly if held.

Let's go through an example to make things simpler.

We want to turn on module 4 at 6:30 PM every day. Let's also dim this module 60 percent (it's our front porch light). We'll need an event to turn the front porch light off at 10:30 PM also.

First we flip the mode switch to edit. If this is our first entry into the event buffer, then the display will show all zeros (the event buffer is filled with all zeros when power is gone on restart); otherwise, the first event in the event buffer will be displayed. In this case, we would have to press the event select switch until the event of interest or a blank event (all zeros) was reached.

At any rate, we're at the event to be added or edited. We now press the digit increment/decrement switch until function 6 is in the first digit (this is the dim 60 percent function). Now we press the digit select switch until the next digit is selected (the digit selected blinks to indicate the active digit). Now we enter day code 8 for every day of the week using the same digit increment/decrement switch. The time is now entered by selecting these digits (time is a 24-hour clock); the time will be 18:30.

So far so good. We now select the module digits and set them for 04. If we blow it anywhere along the way we can just press the digit select switch until the offending digit is reached for edit (the digit to be edited wraps around for convenience). We now press the event select switch to increment to the next event in the event buffer. We then enter the digits 0-8-22:30-04 to turn the module off every day at 10:30 PM.

We're all through editing the events, so we return the mode switch to run mode. If the time of day appears, all is well. If an error message of EE 00 appears, we've put something in the event buffer at location 00 the software doesn't understand. We would have to reedit the event to correct the error.

The entering and editing of events is easier done than said. You should write out your events for control in some sort of orderly fashion and then

- *Initialization routine.* Used to set up 8156, clear event buffer, send DEAD message to display and check if any test routines are to be run. This routine is entered any time a total power failure occurs
- *Main routine.* Main program loop. Checks that power is up, and whether mode switch is activated. Time is set from here. Event buffer is scanned to see if any events are scheduled.
- *Event Process routine.* Used to process any events marked for execution in the event buffer.
- *Fill Memory routine.* Used to fill any area of RAM memory with a predetermined value.
- *Move Memory routine.* Used to move an area of memory from one location to another.
- *Power Check routine.* Used to switch clock from line to internal and monitor line for return of line power.
- *Program Event routine.* Used to program an event into the event buffer.
- *Real-Time Clock Set routine.* Used to set up the time of day in the real-time clock.
- *Edit Display routine.* Used to edit the event in the display.
- *Error Check routine.* Used to verify the events stored in the event buffer for proper format and content.
- *Real Time Clock routine.* Used to provide a real time clock for event scheduling.
- *Send Command routine.* Used to send a command to the controller.
- *Display Refresh routine.* Used to refresh the displays.
- *Font Conversion routine.* Used to provide correct fonts for LED displays.
- *Event Buffer Check routine.* Used to check the event buffer for any events which should be scheduled for process.
- *Test routine.* Used to provide checkout routines for initial debug. The routines, Display Test, Command Test and Memory Test, are activated from here.

Table 3. Internal software routine description.

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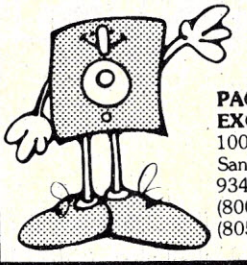

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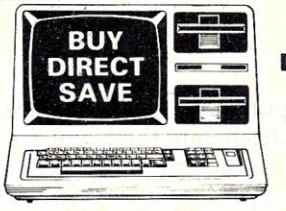

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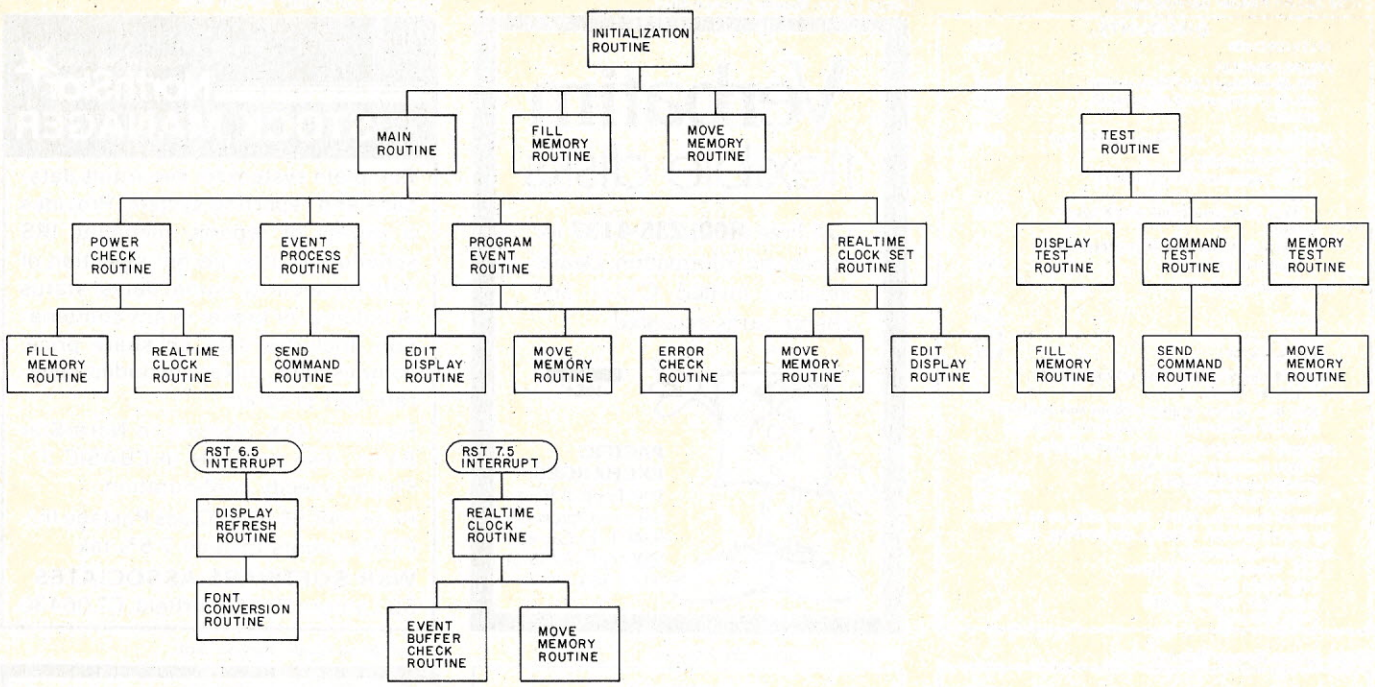

Fig. 3. Software flow diagram.

proceed to put them in all at once. The events are then in the event buffer forever until you either erase them or a long power failure occurs. I usually keep a current list of the contents of my event buffer on hand to help me edit events often changed. I also have several events that are normally marked null. These are used for controlling special lights around the house when we're gone. This gives a house that someone-is-home look to prevent burglaries.

Also, either the events that control my heating or air conditioning are marked null.

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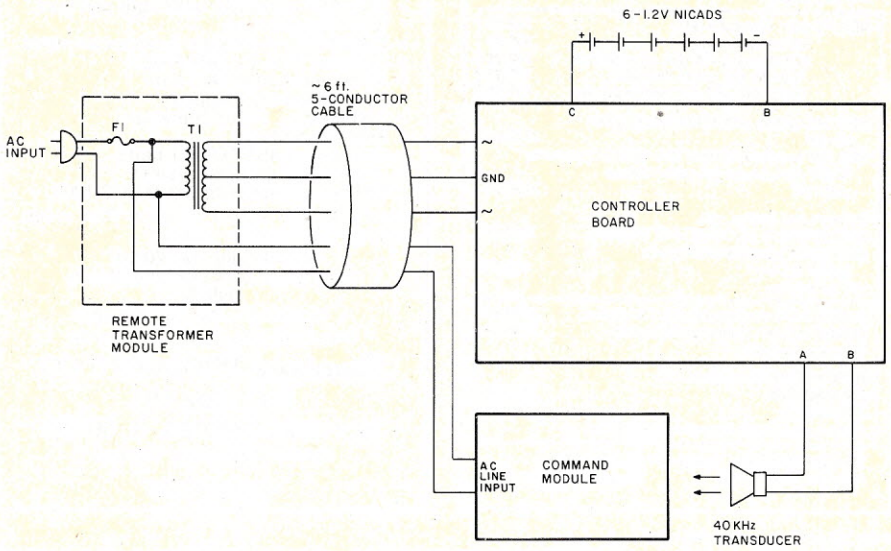

Fig. 4. Wiring diagram.

References

"Computerizing a Home," S. Ciarcia, Jan. 80, *Byte*, p. 28.

"Plug-in Remote Control System," S. Ciarcia, Sept. 80, *Radio Electronics*, pp. 47-51.

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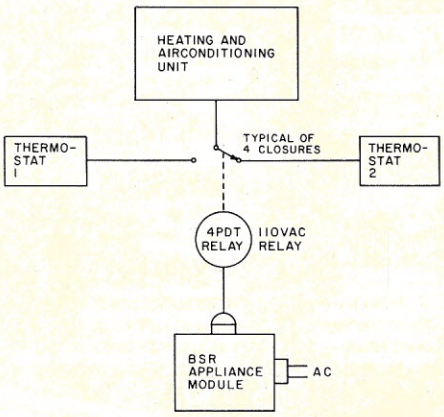

Fig. 5. Controllable heating and air conditioning.

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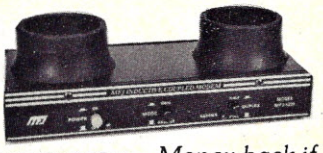

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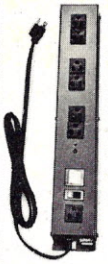

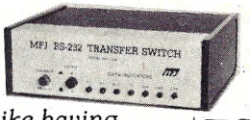

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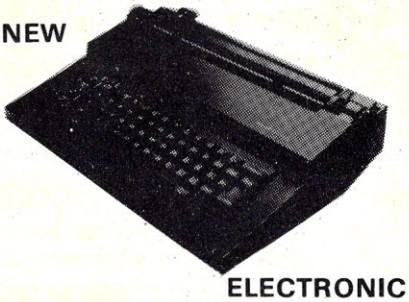

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The Heath Memory Alternative

Double your memory at a less expensive cost than the Heath 16K board with this do-it-yourself memory expansion kit from Trionyx.

By Greg Greene

You should have bought an S-100 bus computer," stated a long-time computer buddy who had invested in a North Star system.

He was right of course. The H-8 computer bus lacked space, which, coupled with a small power supply that limited the bus to nine usable slots and little industry-wide support, made it impossible to expand the H-8 to a full 56K of memory.

It's not that I didn't have enough memory boards on hand to expand with. I had three of the Heath 8K static memory boards, and two of the Godbout 12K static boards. This would give me the 48K of memory that I wanted. But I couldn't find any place to stick them in the motherboard. I already had the front panel board, the CPU board, a serial board for the terminal, a parallel board for the printer and the disk controller board for the drives. In addition, I had the fine breadboard that plugs into the bus (if you can find room), which I wanted to use to interface the H-8 to my HW 101 ham radio rig for Morse code copying. So I had more boards than space.

This left me with several alternatives. I could try to expand the motherboard to take more boards. This means a larger power supply and cabling the two boards together (with attending cross-talk problems). Many people have done this successfully with their H-8s, but I was not too enamoured with the tin-plated Heath motherboard as it was, and tying another one onto it didn't seem like the way to go.

Or I could trade in the 8K boards on 16K boards from Heath at the local store. In considering this course of action I took into account that I would be losing half of the boards' value in the trade-in and I wouldn't be gaining any more memory. Also, the price of the 16K board would be about $750 up here in Canada, so the price for one extra slot was just too high.

> It's cheaper than the Heath 16K board, and it came with twice as much memory.

Last, I could seek out a new board that wouldn't take up as much space as the old ones; this meant that it had to be a minimum of 32K.

S-100 owners have long enjoyed the ability to mix and match boards from many different sources. Heathkit, on the other hand, has held a captive market for the most part. But it's beginning to change. First Godbout came on the market with their excellent 12K static design as the first alternative source for memory boards. They quickly followed this with 24 and 16K static designs. These boards were more cost effective than those from Heathkit.

Next on the memory board scene were 32K boards from DG Electronics. These dynamic boards offered transparent refresh and saved even more space. They were available only in a tested and assembled version. I gave these boards some thought, but it seemed that to bring the memory up to 56K I would still have to add another 24K with at least two other boards. Since I would eventually want to bring the memory up to full capacity anyway, why not try for a board that could do it all in one neat package.

This brought me to the Trionyx 64K board. This is also a dynamic memory board that uses the 4116 16K memory chip in the TRS-80, Apple and Heath H88 and H89. It was also available as just a bareboard that you could add to or in kit form of any 16K capacity (that is, 16, 32, 48 or 64K), or in assembled and tested versions of the same.

The board features transparent refresh, which means that the circuitry for refreshing the RAMs comes from the board itself at a time when the CPU is not using the memory. This allows it to run with no wait states if used with 300 ns memory chips or faster. The price of the board was $400 U.S., which, with customs and duty and after exchanging the American dollar for Canadian, results in a total price of $600. At that it is cheaper than the Heath 16K board, and it came with twice as much memory.

I ordered the kit by phone, and it was in my hands inside of three weeks. The kit comes with several pages of documentation that cover

Address correspondence to Greg Greene, 207-885 Craigflower Road, Victoria, B.C. V9A 2X4.

the theory and design of the board and include oscilloscope waveform patterns of various signals and some construction hints. A detailed parts list finishes off the package.

The parts list gives the parts identification number that matches with the silk-screening on the board, a colorcode identifier for resistors, and parts numbers for the rest. All you have to do is match the parts with the board and you're in business.

Assembly

When it comes to assembly instructions the documentation is definitely not Heathkit. They assume that since you will not in all likelihood be buying the board without some experience in putting things together (an H-8 for instance), you will not have any trouble with the kit. For those of you who are a little unsure, here is how I did it.

First, solder in the resistor paks; do not use sockets for these. Next, match up the silk-screen legend with the parts list and solder in all the resistors. The two small inductors (they may look like resistors) come next, followed by the sockets.

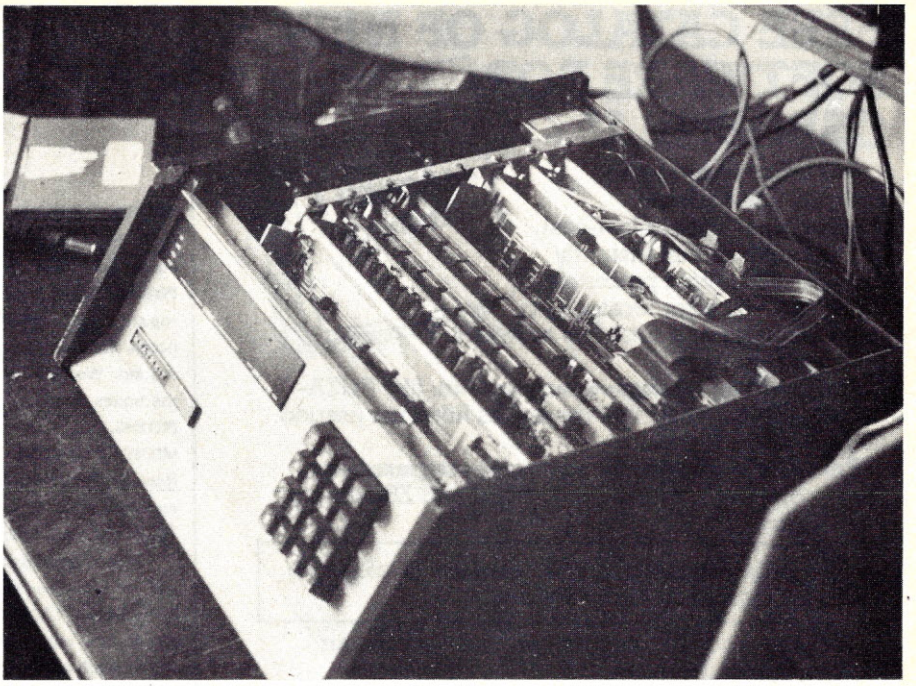
Take a look at the sockets. Notice that they are not tin plated; rather, they are top-quality gold-plated ones. Solder these so that the memory chips begin at the top left of the board.

The capacitors are next. Watch carefully around the memory section; apparently, not all the holes are used. Finish off with the voltage regulators and transistor. Notice the motherboard connector; it's also gold-plated. If Heath put out their boards with gold-plated connectors instead of tin, I think I would have a lot fewer gremlins than I now do.

Trionyx lists a gold-plated replacement motherboard connector. If you get another bare motherboard from Heath, solder it up with these and then replace the old one in the H-8; that should just about eliminate all the bugs.

After finishing the board, check it for any bridges. The board is solder masked but some of the traces are close; make sure you get all the pieces in the right spots.

Now put the board on the end of an extender card and try it for the correct voltages. If all is OK, it's time to insert the ICs. The first ones to go in are the TTLs, which fit on the right side of the board. Follow with the memory chips; they're CMOS, so handle them accordingly. Put the board back in the computer. It's addressed as the first memory the computer sees, so your other boards will have to be changed. If the front panel monitor comes on at all, try the Heath memory test. (Those of you with the disk system only need to set the PC counter to 03003, select the BC register pair and press go, since the routine is built into the controller ROM.)



The completed 32K board from Trionyx Electronics (Box 5131-A, Santa Ana, CA 92704) plus two 12K Godbout static boards equal 56K.

If all is OK, then you have a working board. If you have any difficulty, check for bent IC pins, orientation of the parts, etc. If you still can't get it to work correctly, the problem is likely in the timing of the refresh. The documentation describes the troubleshooting procedure, and the folks at Trionyx will be glad to give you a hand if needed.

Conclusions

When I finished, my board worked perfectly, so I can't give you any tips on what trouble to expect. Again, if you take your time and don't do more at one sitting than you're comfortable with, you should expect the same results.

I enjoyed putting this board together, and was especially pleased that it worked the first time, something that does not always happen with the things I build. I have had little experience with dynamic memory, and thus was a little afraid of using it. At the same time, I was more than a little upset that owners of the H-89 and H-88 could upgrade so cheaply. Now that we have Trionyx it is possible to do the same and have more memory, and the advantage of a mainframe with room. ■

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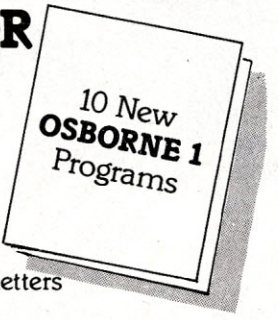

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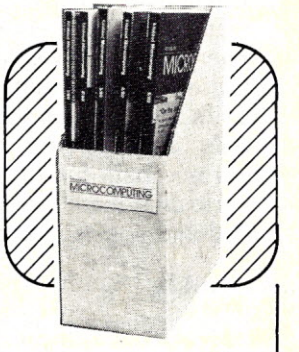

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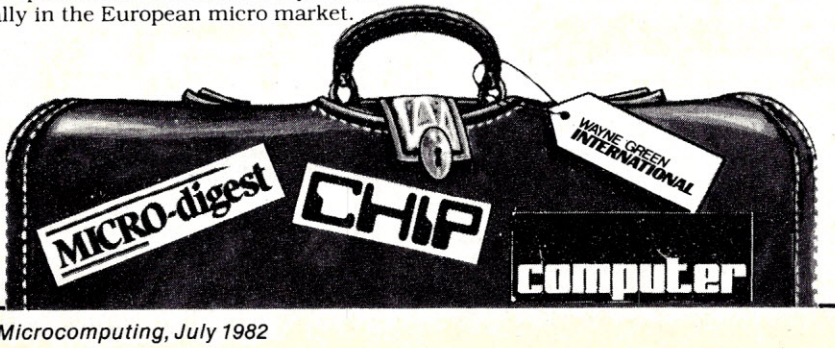

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CORRECTIONS

Two articles in the April issue of *Microcomputing* ("Artificial Intelligence after 25 Years" by Harold Nelson, p. 32, and "Eliza—A Software Classic for Your Micro" by Thomas Parsons, p. 38) included reference to microcomputer adaptations of Joseph Weizenbaum's Eliza program. These are available from Artificial Intelligence Research Group, 921 North La Jolla Ave., Los Angeles, CA 90046, and SuperSoft, Inc., PO Box 1628 Champaign, IL 61820.

The software review of Print II (May 1982, p. 157) incorrectly lists the manufacturer's address and the price for this Apple utility. It is available from Computer Systems Design, 2139 Jackson Blvd., Rapid City, South Dakota 57701, (605) 341-3662, for $24.95.

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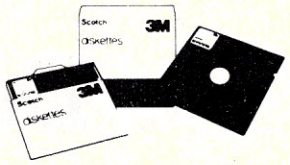

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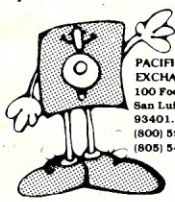

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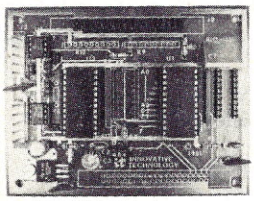

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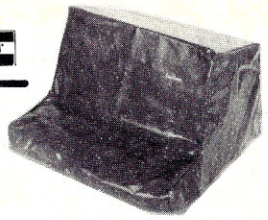

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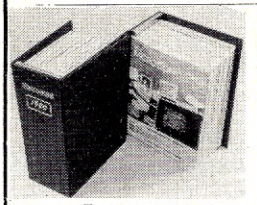

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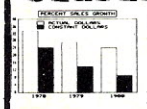

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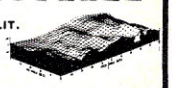

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This Printer Builds Character(s)

Create a character set for your particular application with the Base 2 dot matrix printer.

By Peter R. Ohs

Listing 1. Microsoft Basic program (printed in sample character font) to read and load data into the printer.

```
 1 REM OHS MICRO COMPUTER SERVICES  JULY 1981
 2 REM BASE 2 COMPUTER CHARACTER FONT GENERATION
 3 DEFINT I,K,C:DIM C(127,5)
 4 FOR I=32TO90:FOR K=1TO5:READ C(I,K):NEXT K,I
 5 FOR I=91TO96:FOR K=1TO5: C(I,K)=0:NEXT K,I
 6 FOR I=65TO90:FOR K=1TO5: C(I+32,K)=C(I,K):NEXT K,I
 7 FOR I=123TO127:FOR K=1TO5: C(I,K)=0:NEXT K,I
 8 LPRINTCHR$(27);CHR$(75);
 9 FOR I=32TO127:FOR K=1TO5
10 I8=C(I,K)+128
11 LPRINTCHR$(I8);
12 NEXT K,I
13 LPRINTCHR$(27);CHR$(76);
14 PRINT"FINISHED WITH LOADING COMPUTER FONT"
15 REM LPRINTCHR$(27);CHR$(77); TO REGULAR FONT
31 REM COMPUTER FONT DATA SETS FOLLOW
32 DATA 0,0,0,0,0
33 DATA 0,3,79,3,0
34 DATA 3,7,0,7,3
35 DATA 20,127,20,127,20
36 DATA 36,127,42,127,18
37 DATA 35,19,8,100,98
38 DATA 48,95,79,40,16
39 DATA 0,0,3,7,0
40 DATA 24,60,66,65,0
41 DATA 0,65,66,60,24
42 DATA 18,12,62,12,18
43 DATA 8,8,62,8,8
44 DATA 0,64,48,48,0
45 DATA 0,12,12,12,12
46 DATA 0,0,96,96,0
47 DATA 96,48,24,4,2
48 DATA 62,97,97,97,62
49 DATA 1,97,127,96,96
50 DATA 121,73,73,73,79
51 DATA 73,73,73,127,120
52 DATA 15,15,8,120,124
53 DATA 79,73,73,121,120
54 DATA 127,81,81,83,112
55 DATA 3,97,113,9,7
56 DATA 112,127,73,127,112
57 DATA 15,9,9,121,127
58 DATA 0,108,108,0,0
59 DATA 64,52,52,0,0
60 DATA 48,48,36,66,0
```

More →

The new Base 2 dot matrix printer lets you define and design different character fonts.

I wanted to create my own character set for mailing labels. I first tried to configure a character set similar to the one used on the bottom of checks. I needed some method of designing and defining all the characters so that I could draw, verify and review the characters. Using the word processor, I finally came up with a page full of the diagrams shown in Fig. 1.

To obtain a road map and checklist of all the various characters I needed to design, I wrote a short program that printed the ASCII code and the character represented by this code (see Table 1). I also felt that I didn't need lowercase along with the special ASCII codes 91 to 96 and 123 to

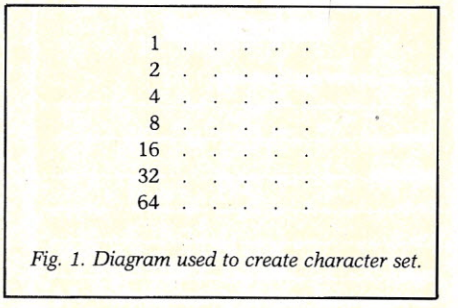

Fig. 1. Diagram used to create character set.

Peter Ohs (4605 Westridge Place, Camp Springs, MD 20748) is the owner of Ohs Microcomputer Services.

127. I used the uppercase alphabetic set to define the lowercase set.

I designed each character with a pencil. I then coded each of the characters and wrote them into a data statement, with the line number of the data statement being equal to its ASCII code. This line-numbering system made verification and correction easy.

To tell Base 2 what type of character you want, use the following system. For example, consider the design of the number 8 (Fig. 2). With the binary numbering system to the left of each character, it became easy to code the five numbers necessary for the Base 2 to interpret this figure. The

```
 1  .  X  X  X  .
 2  .  X  .  X  .
 4  .  X  .  X  .
 8  .  X  X  X  .
16  X  X  .  X  X
32  X  X  .  X  X
64  X  X  X  X  X
```

Fig. 2. Designing the number 8.

Listing 1 continued.

```
61 DATA 54,54,54,54,54
62 DATA 0,66,36,48,48
63 DATA 7,3,89,5,3
64 DATA 12,18,45,45,46
65 DATA 112,127,9,9,127
66 DATA 127,127,73,79,120
67 DATA 127,65,65,67,115
68 DATA 127,127,65,65,62
69 DATA 127,121,73,73,73
70 DATA 127,15,9,9,9
71 DATA 127,127,65,81,119
72 DATA 127,120,8,127,120
73 DATA 0,120,127,0,0
74 DATA 112,64,64,127,112
75 DATA 127,112,24,36,66
76 DATA 112,127,64,64,64
77 DATA 127,98,8,98,127
78 DATA 127,4,8,112,127
79 DATA 127,67,67,67,127
80 DATA 127,121,9,9,15
81 DATA 127,65,81,97,127
82 DATA 127,9,9,127,112
83 DATA 111,105,73,73,121
84 DATA 3,3,127,1,1
85 DATA 127,64,64,127,127
86 DATA 31,32,64,63,15
87 DATA 127,112,8,112,127
88 DATA 99,21,8,21,99
89 DATA 3,4,120,116,3
90 DATA 115,89,77,71,99
```

```
ALL PRINTER VALUES FOR PRINTER: ORIGINAL FONT

32  33  34  35  36  37  38  39  40  41  42  43  44  45  46  47
     !   "   #   $   %   &   '   (   )   *   +   ,   -   .   /

48  49  50  51  52  53  54  55  56  57  58  59  60  61  62  63
 0   1   2   3   4   5   6   7   8   9   :   ;   <   =   >   ?

64  65  66  67  68  69  70  71  72  73  74  75  76  77  78  79
 @   A   B   C   D   E   F   G   H   I   J   K   L   M   N   O

80  81  82  83  84  85  86  87  88  89  90  91  92  93  94  95
 P   Q   R   S   T   U   V   W   X   Y   Z   [   \   ]   ^   _

96  97  98  99 100 101 102 103 104 105 106 107 108 109 110 111
 `   a   b   c   d   e   f   g   h   i   j   k   l   m   n   o

112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
 p   q   r   s   t   u   v   w   x   y   z   {   |   }   ~

ALL PRINTER VALUES FOR PRINTER: COMPUTER FONT

32  33  34  35  36  37  38  39  40  41  42  43  44  45  46  47
     !   "   #   $   %   &   '   (   )   *   +   ,   -   .   /

48  49  50  51  52  53  54  55  56  57  58  59  60  61  62  63
 0   1   2   3   4   5   6   7   8   9   :   ;   <   =   >   ?

64  65  66  67  68  69  70  71  72  73  74  75  76  77  78  79
 @   A   B   C   D   E   F   G   H   I   J   K   L   M   N   O

80  81  82  83  84  85  86  87  88  89  90  91  92  93  94  95
 P   Q   R   S   T   U   V   W   X   Y   Z

96  97  98  99 100 101 102 103 104 105 106 107 108 109 110 111
     A   B   C   D   E   F   G   H   I   J   K   L   M   N   O

112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
 P   Q   R   S   T   U   V   W   X   Y   Z
```

Table 1. ASCII code and corresponding characters.

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five numbers are then entered as DATA 112, 127, 73, 127, 112.

Column 1	(		16	+32	+64)	= 112
Column 2	(1+2+4	+8	+16	+32	+64)	= 127
Column 3	(1	+8			+64)	= 73
Column 4	(1+2+4	+8	+16	+32	+64)	= 127
Column 5	(		16	+32	+64)	= 112

Listing 1 shows the short program I needed to read the data and load it into the Base 2 printer. The program is simple, with the exception of special Base 2 LPrint commands as shown in line 8, which tells the printer to get ready to accept a new ASCII set. Lines 9-12 load the individual 96 ASCII characters and line 13 tells the printer to use the new ASCII set.

With this success under my belt, I then wanted to duplicate the original computer set, which is built into the Base 2 ROM. With this font available I could then change a few special characters for special one-time needs (i.e.,† § ¶) and still use my regular word processor. This way I could replace a † for a # and use the # key for the special symbol †. Of course the bad news is that the screen would still show the #. Listing 2 contains the program and the data statements to duplicate the original character set in the Base 2.■

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 1 REM OHS MICRO COMPUTER SERVICES  JULY 1981
 2 REM BASE 2 REGULAR CHARACTER FONT GENERATION
 3 DEFINT I,K,C:DIM CC127,5)
 4 FOR I=32TO 127:FOR K=1TO5:READ CCI,K):NEXT K,I
 5 LPRINTCHR$(27);CHR$(75);
 6 FOR I=32TO127:FOR K=1TO5
 7 I8=CCI,K)+128
 8 LPRINTCHR$(I8);
 9 NEXT K,I
10 LPRINTCHR$(27);:LPRINTCHR$(76);
11 PRINT"FINISHED WITH LOADING REGULAR FONT"
31 REM REGULAR FONT DATA FOLLOWS
32 DATA 0,0,0,0,0
33 DATA 0,0,79,0,0
34 DATA 0,7,0,7,0
35 DATA 20,127,20,127,20
36 DATA 36,42,127,42,50
37 DATA 35,19,8,100,98
38 DATA 32,86,73,54,48
39 DATA 0,4,2,1,0
40 DATA 28,34,65,65,0
41 DATA 0,65,65,34,28
42 DATA 42,28,62,28,42
43 DATA 8,8,127,8,8
44 DATA 0,64,32,0,0
45 DATA 8,8,8,8,8
46 DATA 0,96,96,0,0
47 DATA 32,16,8,4,2
48 DATA 62,65,65,62,0
49 DATA 0,66,127,64,0
50 DATA 66,97,81,73,70
51 DATA 33,65,69,75,49
52 DATA 8,12,10,127,8
53 DATA 71,69,69,69,57
54 DATA 60,74,73,73,48
55 DATA 1,1,121,5,3
56 DATA 53,73,73,73,54
57 DATA 6,73,73,41,30
58 DATA 0,0,108,0,0
59 DATA 0,64,40,0,0
60 DATA 8,20,34,65,0
61 DATA 20,20,20,20,20
62 DATA 0,65,34,20,8
63 DATA 2,1,89,5,2
64 DATA 62,65,93,86,28
65 DATA 126,9,9,9,126
66 DATA 127,73,73,73,62
67 DATA 62,65,65,65,99
68 DATA 127,65,65,34,28
69 DATA 127,73,73,73,65
70 DATA 127,9,9,9,1
71 DATA 62,65,73,73,57
72 DATA 127,8,8,8,127
73 DATA 0,65,127,65,0
74 DATA 48,65,65,63,1
75 DATA 127,8,20,34,65
76 DATA 127,64,64,64,64
77 DATA 127,2,12,2,127
78 DATA 127,8,16,32,127
79 DATA 62,65,65,65,62
80 DATA 127,9,9,9,6
81 DATA 62,65,81,33,94
82 DATA 127,9,25,41,70
83 DATA 38,73,73,73,50
84 DATA 1,1,127,1,1
85 DATA 63,64,64,64,63
86 DATA 31,32,64,32,31
87 DATA 63,96,24,96,63
88 DATA 99,20,8,20,99
89 DATA 3,4,120,4,3
90 DATA 97,81,73,69,67
91 DATA 127,65,65,65,0
92 DATA 1,2,4,8,16
93 DATA 0,65,65,65,127
94 DATA 4,2,1,2,4
95 DATA 64,64,64,64,64
96 DATA 0,1,2,4,0
97 DATA 32,80,84,84,124
98 DATA 127,68,68,68,56
99 DATA 56,68,68,68,0
100 DATA 56,68,68,68,127
101 DATA 0,56,84,84,24
102 DATA 0,8,126,9,2
103 DATA 8,84,84,84,56
104 DATA 127,8,8,8,112
105 DATA 0,68,125,64,0
106 DATA 0,32,64,61,0
107 DATA 0,127,24,36,64
108 DATA 0,65,127,64,0
109 DATA 120,4,24,4,120
110 DATA 0,120,4,4,120
111 DATA 56,68,68,68,56
112 DATA 0,126,18,18,28
113 DATA 12,18,18,124,64
114 DATA 4,124,8,4,0
115 DATA 72,84,84,84,36
116 DATA 0,8,126,72,32
117 DATA 60,64,64,124,64
118 DATA 28,32,64,32,28
119 DATA 60,64,48,64,60
120 DATA 68,40,16,40,68
121 DATA 0,12,16,80,60
122 DATA 0,100,84,76,68
123 DATA 8,62,65,65,0
124 DATA 0,0,127,0,0
125 DATA 0,65,65,62,8
126 DATA 8,4,4,8,4
127 DATA 127,127,127,127,127
```

Listing 2. Microsoft program to duplicate original character set.

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Circle 204 on Reader Service card.

RAM It on the Apple

The next time you're faced with putting untried code into an expensive PROM chip, try this simple solution.

By Joe Magee

If you like to tinker with your Apple computer as much as I like to tinker with mine, then by now you've designed at least one card to fit into the I/O slots. As you've found, the structure of the I/O is very flexible. The control lines and RAM space available are powerful features.

I recently designed an RS-232 interface for my Apple. I wanted it to function in any slot, and I wanted it to take advantage of the random-access memory (RAM) space provided for each slot to hold its operational software.

If you're like me, you're reluctant to commit even one byte of untried software to an expensive programmable read-only memory (PROM) chip. Granted, the small amount of code required for an operational program to find what slot it is in is simple and reliable, but it may not always fit in each program exactly the same way.

So, I decided that I would need to develop the program in RAM, but not just any RAM – it had to be in the I/O address space. The Apple decodes the I/O RAM, but there is no RAM in the machine at those addresses. The answer was to put some there.

I could have put some on the card I was developing, but that seemed like a waste since a PROM socket was already there. I thought about building a small board, to plug into the PROM socket, that had RAM on it, but the card I was building did not have read/write logic going to the PROM socket. The answer turned out to be a separate card with nothing but RAM on it.

The schematic for the card is presented in Fig. 1. The card has 256 bytes of RAM, address decoding and slot selection. By plugging the card into any I/O slot (except slot 0) and setting the proper switch, the RAM on the card would appear to be in any

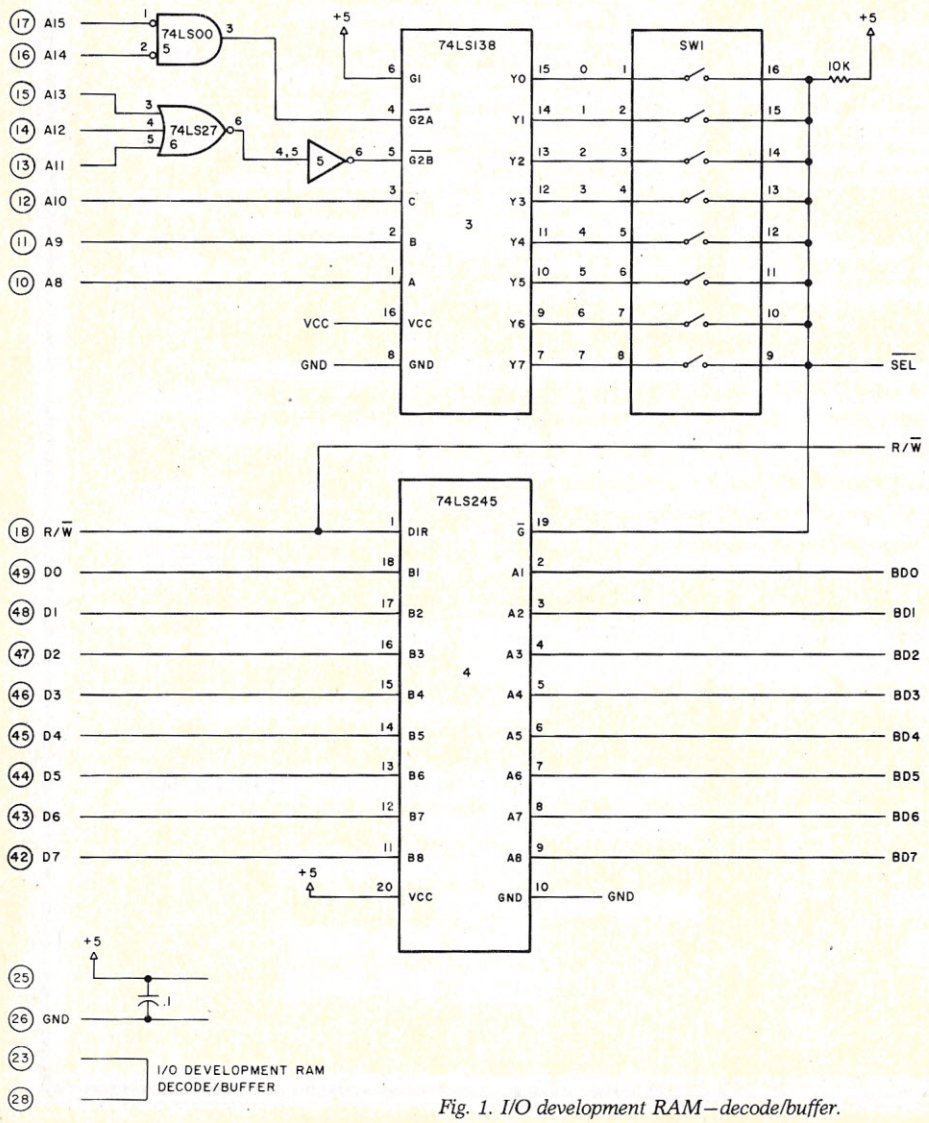

Fig. 1. I/O development RAM – decode/buffer.

Address correspondence to Joe Magee, 3928 Tacoma, Irving, TX 75062.

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3	DATE	Time between dates
4	DAYYEAR	Day of year a particular date falls on
5	LEASEINT	Interest rate on lease
6	BREAKEVN	Breakeven analysis
7	DEPRSL	Straightline depreciation
8	DEPRSY	Sum of the digits depreciation
9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
11	TAXDEP	Cash flow vs. depreciation tables
12	CHECK2	Prints NEBS checks along with daily register
13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
99	RRCONVBD	Investor's rate of return on convertable bond
100	PORTVAL9	Stock market portfolio storage-valuation program

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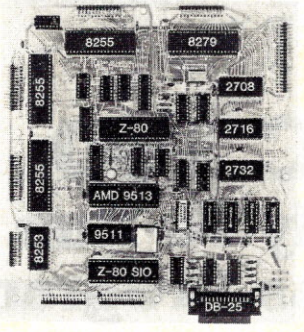

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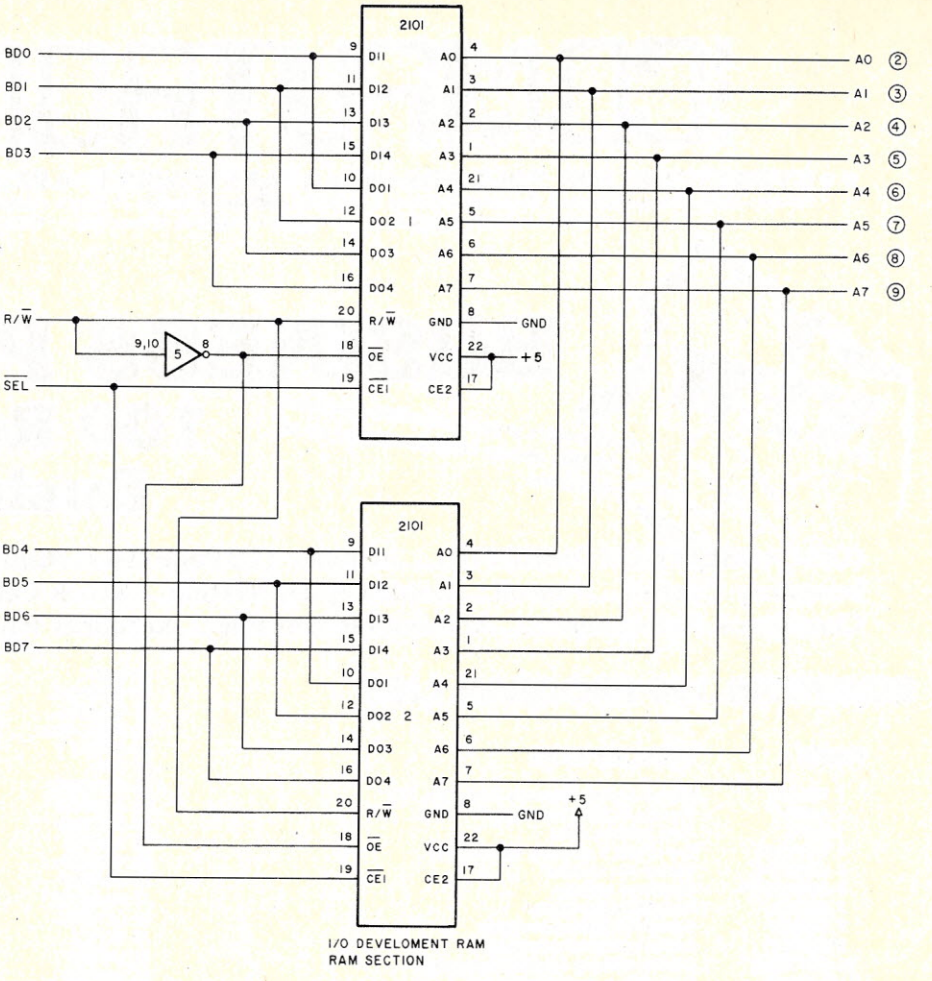

Fig. 2. I/O development RAM–RAM section.

desired slot. Thus, I could put my RS-232 card under development into any slot, the RAM card in any other slot, set the proper switch, and I now had RAM in the address space of the slot where the RS-232 card was. (Of course, I left the PROM socket empty during this time.)

Now I could develop the operational software without any concern for simulating slot-dependent considerations. The code that resulted would be already tested for all those problems, and the first time I blew the program into an expensive PROM, it should work the way I expected. And sure enough—it did.

How the RAM Card Works

The card is simple. It consists of the RAM, address decoding logic and bus transceiving logic.

ICs 1 and 2 are the RAM chips. They are 2101s, which are 256 by 4 bit static RAM chips. Two together give a 256-byte memory space, just what was needed.

ICs 3, 5 and 6 are the address decoding logic. The Apple I/O RAM is in 256-byte blocks starting at hexadecimal C100 and going through C7FF. The logic for the enable lines to IC3 is used to enable the 74LS138 only when the address lines A15 through A11 are in the binary state 11000. This enables the 74LS138 only between addresses C000 and C7FF, the I/O RAM address space. By connecting A8, A9 and A10 to the A, B and C inputs of IC3, one of the outputs would go low for each block of 256 bytes between C000 and C7FF. By routing all these lines through an eight-position DIP switch, any one line could be selected for the chip select line on the RAM chips. Thus, regardless of the slot the RAM card was in, the RAM could be selected as if it were in any desired slot.

The select line also goes to IC4, which is a 74LS245, an eight-bit bus transceiver. The select line and R/W lines together enable IC4 and select the direction of data. Thus, the RAM can either be written to or read from. The IC4 also serves to buffer the data bus.

Not very complex, but it sure beats putting almost the right code into an expensive PROM. ■

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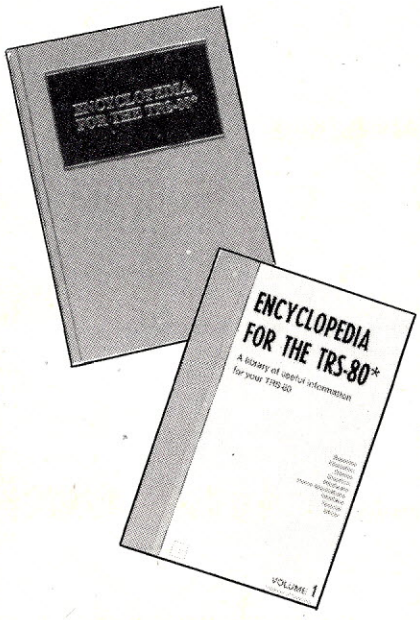

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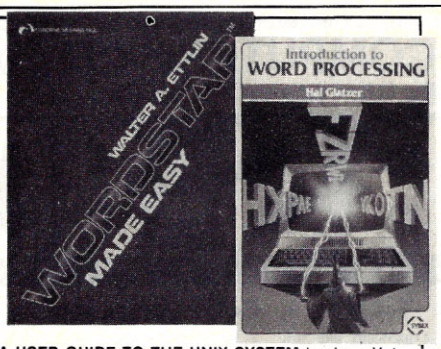

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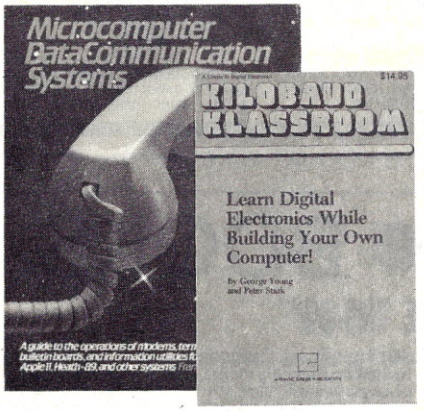

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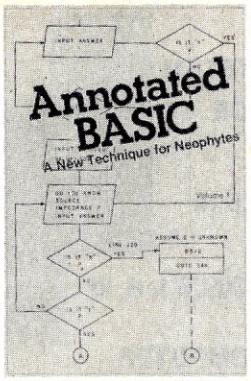

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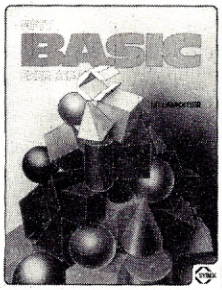

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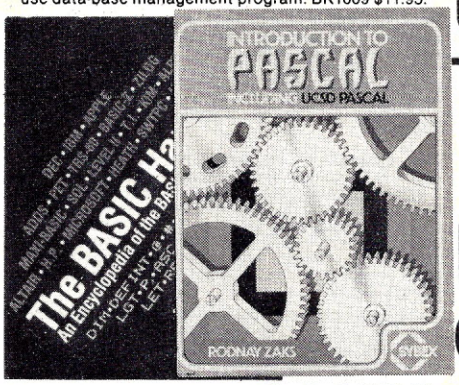

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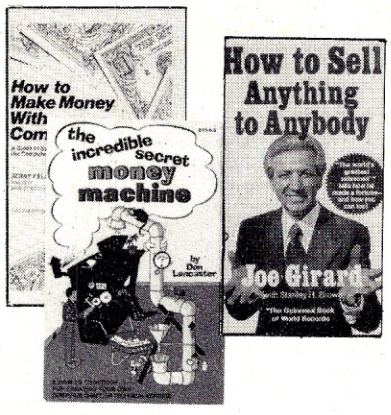

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Z-80

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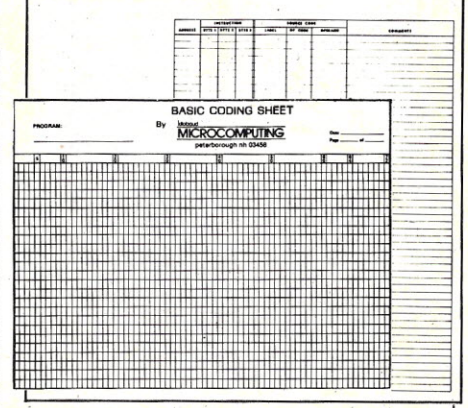

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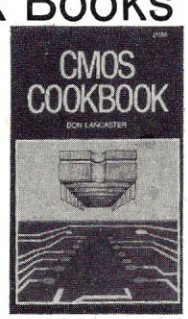

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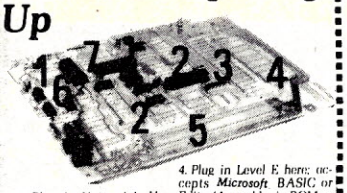

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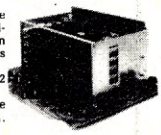

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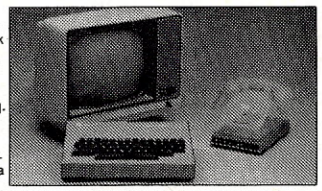

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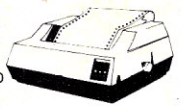

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7430	.18	74125	.40
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74LS13	45	74LS153	70
74LS14	89	74LS157	70
74LS20	24	74LS158	70
74LS21	24	74LS161	85
74LS26	30	74LS162	85
74LS27	28	74LS163	85
74LS28	32	74LS164	85
74LS30	24	74LS165	85
74LS32	32	74LS169	1 55
74LS37	50	74LS170	1 55
74LS38	32	74LS174	85
74LS42	50	74LS175	85
74LS48	70	74LS190	90
74LS51	24	74LS191	90
74LS55	35	74LS221	1 10
74LS74	35	74LS240	95
74LS75	48	74LS241	95
74LS76	38	74LS244	85
74LS78	50	74LS245	1 65
74LS83	70	74LS248	1 00
74LS86	38	74LS249	90
74LS90	60	74LS251	1 20
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74LS92	65	74LS257	80
74LS93	60	74LS258	80
74LS95	80	74LS259	1 25
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74S15	55	74S175	95
74S20	55	74S181	4 00
74S22	75	74S182	2 75
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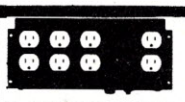

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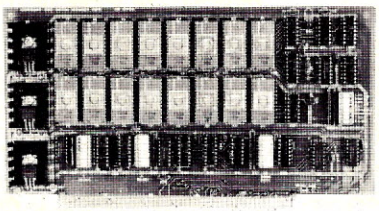

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6. On board wait state circuitry if needed.
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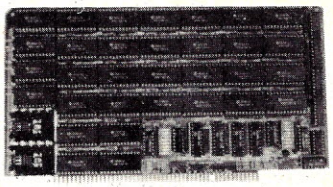

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- ★ 2716 EPROMs may be installed in any of top 48K.
- ★ Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- ★ Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
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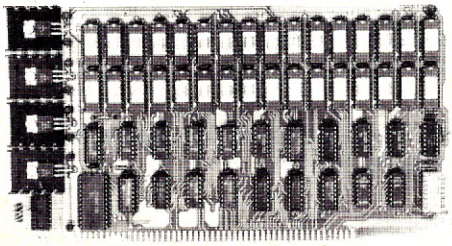

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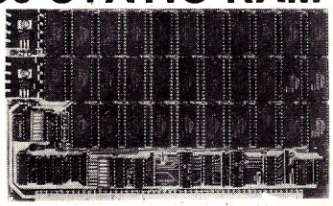

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- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
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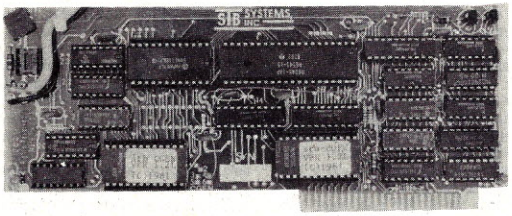

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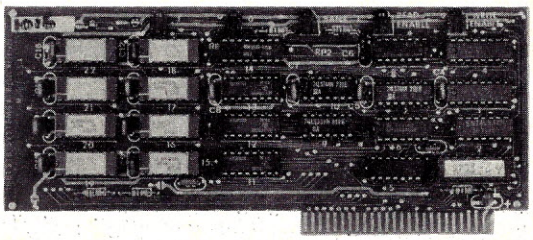

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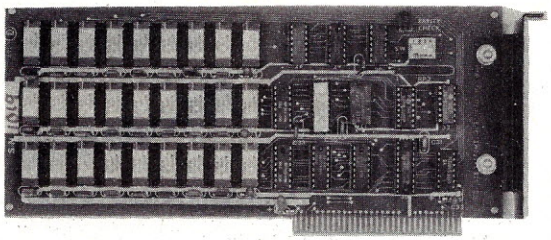

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7404N	.22	LM320K-5	1.35	CD4020	.95	8T98	.99	Complete Set	9.50
7409N	.19	LM320K-12	1.35	CD4021	.95				
7410N	.19	LM320K-15	1.35	CD4022	1.10	**MOS/MEMORY RAM**		**Stopwatch Kit**	**26.95**
7414N	.55	LM320T-5	.85	CD4023	.28	2101-1	1.95	**Auto Clock Kit**	**17.95**
7420N	.19	LM320T-8	.85	CD4024	.75	2102-1	.85	**Digital Clock Kit**	**19.75**
7430N	.19	LM320T-12	.85	CD4025	.23	2102AL-4	1.25		
7442N	.49	LM320T-15	.85	CD4026	1.65	2102AN-2L	1.65	**RESISTORS ¼ watt 5%**	
7445N	.69	LM323K-5	4.95	CD4027	.65	2104A-4	4.95	10 per type	.05
7447N	.69	LM324N	.59	CD4028	.80	2716 5 Volt	5.50	100 per type	.015
7448N	.69	LM339N	.99	CD4029	.95	8/2716 5 Volt	39.00	1000 per type	.012
7474N	.35	LM340K-5	1.35	CD4030	.45	2111-1	2.99	5000 per type	.0085
7475N	.49	LM340K-8	1.35	CD4035	.85	2112-2	2.99	350 piece pack,	
7485N	.85	LM340K-12	1.35	CD4040	.65	2114	2.24	5 per type	8.95
7489N	1.70	LM340K-15	1.35	CD4042	.75	2114L 300ns	2.50		
7490N	.35	LM340K-24	1.35	CD4043	.85	2114L 450ns	2.37	½ watt 5% per type .05	
7495N	.55	LM340T-5	.75	CD4044	.85	4116 200ns	2.50		
74100N	1.00	LM340T-8	.75	CD4046	.95	8/4116 200ns	14.90	**DIP SWITCHES**	
74107N	.30	LM340T-12	.75	CD4049	.45	MM5280	3.00	4-position	.85
74123N	.55	LM340T-15	.75	CD4050	.55	MM5321	9.95	5-position	.90
74125N	.45	LM340T-18	.75	CD4051	.95	MM5330	5.94	6-position	.90
74145N	.60	LM340T-24	.75	CD4060	1.42	P5101L	8.95	7-position	.95
74150N	1.20	LM350	5.50	CD4066	.71	4200A	11.50	8-position	.95
74151N	.65	LM377	2.29	CD4068	.39	9368	3.50		
74154N	1.25	LM380N	1.00	CD4069	.35	4100	10.00	**KEYBOARDS**	
74157N	.55	LM381	1.60	CD4070	.35	416	2.50	56 key ASCII keyboard kit	$74.95
74161N	.70	LM382	1.60	CD4071	.30	TMM2016	16.95	Fully assembled	84.50
74162N	.85	LM709H	.59	CD4072	.30	HM6116	16.50	Enclosure Plastic	19.95
74163N	.85	LM723H/N	.49	CD4073	.35			Metal Enclosure	99.95
74174N	.89	LM733N	.85	CD4075	.30	**CLOCKS**			
74175N	.85	LM741CH	.35	CD4076	.95	MM5311	4.95	**LEDS**	
74190N	1.15	LM741N	.35	CD4078	.30	MM5312	3.90	Red T018	.15
74192N	.79	LM747H/N	.75	CD4081	.30	MM5314	3.90	Green, Yellow T018	.20
74193N	.79	LM748N	.50	CD4082	.30	MM5369	1.95	Jumbo Red	.25
74221N	1.25	LM1303N	1.75	CD4116	.41	MM5841	14.45	Green, Orange, Yellow Jumbo	.25
74298N	.85	LM1304	1.10	CD4490	5.50	MM5865	7.95	**Cliplite LED Mounting Clips**	4/.80
74365N	.65	LM1305	1.27	CD4507	.99	CT7010	8.95	(spec: red, amber, green, yellow, clear)	
74366N	.65	LM1307	1.10	CD4508	1.95	CT7015	8.95		
74367N	.65	LM1310	2.75	CD4510	.95	MM5375AN/N	3.90	**CONTINENTAL SPECIALTIES in stock**	
		LM1458	.55	CD4511	.94	MM5375AG/N	4.90	Complete line of breadboard test equip.	
74LS00 TTL		LM1812	8.25	CD4515	2.25	7205	16.50		
74LS00N	.25	LM1889	2.49	CD4516	1.10	7207	7.50	**OK WIRE WRAP TOOLS in stock**	
74LS02N	.25	LM2111	1.75	CD4518	1.25	7208	15.95	Complete line of AP Products in stock.	
74LS04N	.25	LM2902	2.25	CU4520	1.02	7209	4.95		
74LS05N	.25	LM3900N	.59	CD4527	1.51			**SPECIAL PRODUCTS**	
74LS08N	.35	LM3905	1.25	CD4528	1.25	**MICROPROCESSOR**		2.5 MHz Freq. Counter Kit	37.50
74LS10N	.25	LM3909N	.95	CD4553	3.50	6502	6.95	30 MHz Freq. Counter Kit	47.75
74LS13N	.45	MC1458V	.55	CD4566	2.45	6502A	9.50		
74LS14N	.75	NE550N	1.30	CD4583	2.35	6504	6.95	**AC TRANSFORMERS**	
74LS20N	.25	NE555V	.39	CD4585	.95	6522	8.75	**FRAME**	**WALL PLUG**
74LS22N	.25	NE556A	.65	CD40192	3.00	6530	9.50	6V 500 ma $4.00	10V 2 amp $7.95
74LS32N	.35	NE565A	1.00	74C00	.35	6532	14.95	6.3V CT 600 ma 4.60	12V 250 ma 2.95
74LS30N	.25	NE566V	1.50	74C04	.35	6551	11.85	12V 250 ma 1.95	12V CT 250 ma 3.75
74LS33N	.55	NE567V	1.00	74C10	.35	6800	5.70	12.6V CT 600 ma 4.95	12V 500 ma 4.50
74LS38N	.35	NE5709	4.75	74C14	.75	6802	11.95	12.6V CT 2 amps 5.95	12V 1 amp 5.95
74LS74N	.45	78L05	.60	74C20	.35	6820	4.95	12.6V CT 4 amp 8.60	12V 2 amp 7.95
74LS75N	.50	78L08	.60	74C30	.35	6850	3.50	12.6V CT 8 amp 10.80	6, 9, 12 VDC
74LS90N	.60	78M05	.85	74C48	1.95	8080A	3.95	24V CT 100 ma 3.95	300 ma 8.95
74LS93N	.65	7510B	1.49	74C74	.85	8085A	8.50	24V CT 600 ma 4.95	9 VDC 500 ma 3.75
74LS95N	.85	75491CN	.50	74C76	.80	780A	6.00		
74LS107N	.40	75492CN	.55	74C90	1.25	8080B	18.95	**Constant Voltage Transformers** 12V, 11 amp; 5V, 23 amp; 24V, 11 amp 15.00	
74LS112N	.45	75494CN	.89	74C93	1.25	780B P10	6.50		
74LS113N	.45			74C154	3.25	780A P10	5.95		
74LS132N	.75	**A to D CONVERTER**		74C160	1.69	780 CTC	5.95		
74LS136N	.49	8038B	4.50	74C175	1.19	780A CTC	8.65		
74LS151N	.75	8700CJ	13.95	74C192	1.65	780 DART	15.25		
74LS155N	.79	8701CN	22.00	74C221	1.90	780A DART	18.75		
74LS157N	.75	8750CJ	13.95	74C905	6.00	780 DMA	17.50		
74LS162N	.95	9400CJ/VF	7.40	74C914	1.95	780A DMA	27.50		
74LS163N	.95	ICL7103	9.50	74C922	5.00	780 S10/0	23.95		
74LS174N	.95	ICL7107	14.25	74C923	5.50	780A S10/0	28.95		
74LS190N	1.00			74C925	6.75	780 S10/2	23.95		
74LS221N	1.19	**CMOS**		74C926	6.95	780A S10/2	28.95		
74LS258N	.69	CD4000	.25	74C927	6.95	780B CTC	17.95		
74LS367N	.69	CD4001	.35			780B P10	17.95		
		CD4002	.35	**INTERFACE**		8212	1.85		
LINEAR		CD4005	.95	8095	.65	8214	3.75		
CA3045	.90	CD4007	.25	8096	.65	8216	1.80		
CA3046	1.10	CD4008	.95	8097	.65	8224	2.50		
CA3081	1.80	CD4009	.45	8098	.65	8228	4.95		
CA3082	1.90	CD4010	.45	8T09	1.25	8251	4.75		
CA3089	3.40	CD4011	.35	8T10	1.75	8253	8.95		
LM301AN/AH	.34	CD4012	.25	8T13	1.40	8255	4.75		
LM305H	.87	CD4013	.45	8T20	4.95	8257	8.75		
LM307N	.35	CD4014	.95	8T23	1.75	8259	6.90		
LM308N	.98	CD4015	.95	8T24	1.75	8202C plas.	13.95		
LM309K	1.25	CD4016	.45	8T25	3.20	8202E plas.	17.95		
LM311H/N	.64					1851P	5.95		

UART/FIFO

AY5-1013	3.95
3341	6.95

PROM

1702A	4.50
2532	17.50
2708	7.95
2716TI	8.50
2716 5 Volt	5.50
8/2716 5 Volt	39.00
2732	16.50
2758	7.49
8741A	39.95
8748	28.00
8748-8	34.95
8755A	34.00
N82S23	2.95
N82S123	3.95
N82S126	5.75
N82S129	4.75
N82S131	4.95
N82S135	8.75
N82S137	8.75
DM8577	2.90
8223	3.50

CONNECTORS

30 pin edge	2.50
44 pin edge	2.75
86 pin edge	4.00
100 pin edge	3.95
100 pin edge w/w	4.95

IC SOCKETS

Solder Tin		Low Profile	
PIN	1UP	PIN	1UP
8	.13	22	.30
14	.14	24	.30
16	.16	28	.40
18	.20	36	.58
20	.29	40	.49

WIRE WRAP LEVEL 3

PIN		PIN	
14	.55	24	.93
16	.57	28	1.00
18	.67	40	1.59

CRYSTALS

1 MHz	4.50
2 MHz	3.95
4 MHz	3.95
5 MHz	3.95
10 MHz	3.95
18 MHz	3.90
20 MHz	3.90
32 MHz	3.90
32768 Hz	4.00
1.8432 MHz	4.50
3.5795 MHz	1.20
2.0100 MHz	1.95
2.097152 MHz	3.95
2.4576 MHz	3.95
3.2768 MHz	3.95
5.0688 MHz	3.95
5.185 MHz	3.95
5.7143 MHz	3.95
6.5536 MHz	3.95
14.31818 MHz	3.95
18.432 MHz	3.95
22.1184 MHz	3.95

KEYBOARD ENCODERS

AY5-2376	11.95
AY5-3600PRO	17.95
74C922	5.49
74C923	5.50
HD0165-5	7.95

D Connectors RS232

DB25P	2.95
DB25S	3.50
DE9P	1.95
Cover	1.25

4116 200ns Dynamic RAM 8/$14.90

3½" COMPUTER FAN $7.75

1982 IC MASTER $75.00

INTRODUCING A BRAND NEW MICROCOMPUTER

Venture

VENTURE is a single board computer that is an adventure for the hobbyist. It is a learning, training computer as well as just plain fun for anyone who wants to get into a state-of-the-art computer at reasonable cost.

VENTURE comes in kit form or fully assembled and tested. You can get it in its minimum configuration for as little as $195.00 or take it all the way to floppy disks and voice. It can be expanded as a kit or fully assembled, at your own pace and choice.

VENTURE is a 16" by 20" main board with separate ASCII and HEX keyboards. It runs fast, almost 4 MHz, and has the capability of putting almost 1 megabyte of RAM and ROM on the board along with a variety of inexpensive options.

A 16-channel analog-to-digital converter allows use of joysticks, control functions, instrumentation, temperature sensing, etc. T1 sound generator, software controlled music, Votrax voice synthesizer and real time clock calendar add to its versatility.

A standard 60-pin bus with 5 slots, parallel ports and 2 serial ports with full handshaking (75 to 9600 BAUD) allow expansion into floppy disks, color, EPROM programmer, printer, modem of your choice. Later expansion will add a light pen, a universal user programmable music sound board, General Purpose Instrument Bus, and a high resolution color/grayscale pixel mapped video board.

VENTURE connects directly to a monitor or to your TV set through an RF modulator. And now for the heart of VENTURE . . . its video display. VENTURE has a high resolution programmable video display with up to 4096 user-defined characters, alphanumeric symbols, special graphics or objects, such as space ships, etc. Each character is 8 pixels wide by 15 pixels high, with 2 grayscale maps; it has 64 levels of grayscale plus video invert/compliment and hidden screen update for a "snow" free display. The display is 512 x 512 pixel mapped with 2 planes of video RAM per display. VENTURE video is in short . . . astounding!

VENTURE has complete software support with full BASIC, 3 ROM monitors, disassembler/assembler/editor. It will run real-time video games, all RCA chip 8 programs and all current Quest 1802 software. VENTURE DOS will accommodate up to three 5¼" double density floppies. A complete 1802 programming book is available. All versions of VENTURE are shipped with a set of manuals written to be understood by the inexperienced as well as experienced user.

On-Board Options

16 channel A to D; 5 slot 60 pin bus, 2 serial ports, parallel ports; 3 video options, 48K RAM, Votrax voice synthesizer, sound generator, EPROM; full BASIC dissassembler, editor, assembler; metal cabinet, additional power supply, ASCII keyboard real time clock calendar.

Expansion Options

Floppy disk, EPROM programmer, light pen, universal user programmable music, sound board high resolution color/grayscale pixel mapped video board, General Purpose Instrument Bus.

Minimum VENTURE System $195.00

Kit includes CPU and control with 4K of RAM, 1K of scratchpad, 2K monitor, 1861 video graphics, cassette interface and separate HEX keyboard with LED displays for address and output. Power supply is included along with 2 game cassettes. The main board is 16" x 20" and includes space for all of the previously discussed on-board options. Full on-board expansion can be completed for under $1000.00. Call for further details, option prices, etc.

RCA Cosmac 1802 Super Elf Computer $106.95

The Super Elf is a tremendous value as it combines video, digital displays, LED displays, and music, all on a single board for $106.95.

The Super Elf expansion capability is virtually unlimited and you can do it inexpensively one step at a time. Expansion includes casstte interface, additional memory, color video, Basic, ASCII keyboard, printer, floppy, S-100 bus, RS232, etc.

The Super Elf comes complete with power supply and detailed 127 page instruction manual which includes over 40 pages of software, including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D. A monthly newsletter. Questdata is devoted exclusively to software for the Super Elf and there are many software books available at low cost.

The Super Elf computer system is now available as a series of bare boards as well as full kits and assembled.

Bare Boards: Super Elf $35.00. Super Expansion $35.00. Power Supply $10.00. S-100 Color $35.00. Dynamic RAM $40.00. Manuals $10.00. Super Basic $45.00.

Free 14 Page Brochure

Send or call for a free brochure on all details and pricing of the Super Elf and its expansion. We will get it right out to you!

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range $\pm .17E^{38}$), 32 bit integer ±2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including **renumber** and essentially **unlimited variables.** Also, an exclusive user expandable command library.

Serial and Parallel I/O routines included.

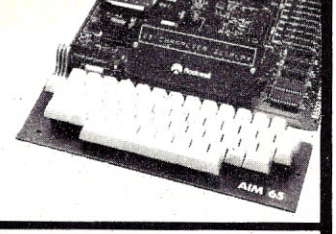
Super Basic on Cassette $45.00.

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display ROM monitor;, fully expandable. **$419.00.** 4K version **$438.00**. 4K Assembler **$29.00**, 8K Basic Interpreter **$59.00**.

Special small power supply 5V 2A 24V .5A assem. in frame **$59.00.** Molded plastic enclosure to fit both AIM 65 and power supply **$52.50.** AIM 65 1K in cabinet with power supply, switch, fuse, cord assem. **$546.00.** 4K **$565.00. A65/40-5000 AIM 65/40 w/16K RAM and monitor $1295.00.** RAM Board Kit (16K, $195) (32K, $215). VD640 Video Interface Kit **$119.00.** A&T **$149.00.** Complete AIM 65 in thin briefcase with power supply **$507.00.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$598.00**

AIM 65/KIM/SYM/Super Elf 44 pin expansion board; board with 3 connectors **$22.95. *Send for complete list of all AIM products.**



Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Super Color S-100 Video Kit $99.00

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80, etc. **Dealers: Send for excellent pricing/margin program.**

Apple Peripheral Kits

SERIAL I/O INTERFACE 0 to 30,000 baud, D.T.R., Input & output from monitor or basic, or use Apple as intelligent terminal, Bd only (P/N 2) **$14.95,** Kit (P/N 2A) **$51.25,** Assembled (P/N 2C) **$62.95.**

PROTOTYPING BOARD (P/N 7907) **$21.95.**

PARALLEL TRIAC OUTPUT BOARD 8 triacs, each can switch 110V, 6A loads, Bd only (P/N 210) **$19.20,** Kit (P/N 210A) **$119.55.**

APPLE II GAME PADDLES Adam and Eve **$38.00.**

Interface Kits

SERIAL/PARALLEL INTERFACE Bidirectional, Baud rates from 110 to 19.2K, sw selectable polarity of input and output strobe, 5 to 8 data bits, 1 or 2 stop bits, parity odd or even or none, all characters contain a start bit, +5 & −12V required.Bd only (P/N 101) **$11.95,** Kit (P/N 101A) **$42.89.**

RS-232/TTL INTERFACE Bidirectional, requires ±12V, Kit (P/N 232A) **$9.95.**

RS-232/20mA INTERFACE Bidirectional, 2 passive opto-isolated circuits, Kit (P/N 7901A) **$14.95.**

PROM Eraser

Will erase 25 PROMs in 15 minutes. Ultraviolet, assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$83.00** (with timer **$119.00**).

Z80 MicroProfessor $149.00

Single board computer. Learning, teaching, prototyping. 2K RAM, keyboard, displays; cassette interface. Tiny BASIC **$19.00**. All fully assembled.

Z80 Microcomputer Kit $69.00

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$79.00.** Monitor **$20.00.** Power Supply Kit **$35.00.** Tiny Basic **$30.00.**

Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in June, July, Aug. *Radio Electronics,* 1981.

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

Type-N-Talk by Votrax

Text to speech synthesizer with unlimited vocabulary, built-in text to speech algorithm, 70 to 100 bits per second speech synthesizer, RS232C interface **$359.00.** Speech IC **$72.00.**

Direct Connect Modem $99.00

Fully assembled in case with RS232 cable. Orig/answer, 103 compatible, 9V battery or wallplug.

TERMS: $5.00 min. order U.S. Funds. Calif. residents add 6% tax. $10.00 min. VISA and MasterCard accepted. $1.00 insurance optional. Shipping: Add 5%; orders under $25.00—10%.

Prices subject to change

FREE: Send for your copy of our NEW 1982 QUEST CATALOG. Include 88¢ stamp.

Circle 44 on Reader Service card.

Orange County • Sunnyvale
San Diego • Los Angeles
San Fernando Valley • Dallas

Dot Matrix Printers

NEW EPSONS with GRAFTRAX-plus

Epson has improved and upgraded their best selling line of printers to include their new GRAFTRAX-plus graphics package. Features now include; 9 x 9 matrix, bi-directional/logic seeking, line spacing to n/216, programmable forms length and horizontal tabs, skip over perf, italics fonts, international symbols, superscript/subscript, normal, emphasized, double-strike, and double-emphasized print, underlining, line drawing graphics, 60/120 DPI bit image, software reset, adjustable right margin, and true back space.

MX-80 with GRAFTRAX-plus *80 column, 80 CPS, adjustable pin feed.*
PRM-28080 *MX-80 w/GRAFTRAX-plus* **$479.95**

MX-80FT with GRAFTRAX-plus *same as MX-80 with friction feed added.*
PRM-28082 *MX-80FT w/GRAFTRAX-plus* **$559.95**

MX-100 with GRAFTRAX-plus *132 column, correspondence quality, up to 15" paper, friction feed & adjustable pin feed, 9 x 9 dot matrix, 80 CPS.*
PRM-28100 *MX-100 w/GRAFTRAX-plus* **$754.95**

PRA-27084 *Serial interface* **$54.95**
PRA-27088 *Serial intf & 2K buffer* **$144.95**
PRA-27081 *Apple card* **$39.95**
PRA-27082 *Apple cable* **$19.95**
PRA-27086 *IEEE 488 card* **$52.95**
PRA-27087 *TRS-80 cable* **$24.95**
PRA-27085 *GRAFTRAX II* **$59.95**
PRA-28085 *GRAFTRAX-plus* **$79.95**
PRA-27090 *Extra print head* **$44.95**
PRA-27083 *MX-80 ribbon cart.* **$13.95**
PRA-27101 *MX-100 ribbon only* **$9.95**

BETTER THAN EPSON ! - Okidata

Microline 82A *80/132 column, **120 CPS**, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (optional), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking, **both serial & parallel interfaces included**, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics*
PRM-43082 *Friction & pin feed* **$499.95**

Microline 83A *132/232 column, 120 CPS, handles forms up to 15" wide, removable tractor, plus all the features of the 82A.*
PRM-43083 *with FREE tractor* **$744.95**

Microline 84 *132/232 column, 200 CPS, full dot graphics built in, handles forms up to 15" wide, plus all the features of the 83A.*
PRM-43084 *Centronics parallel* **$1149.95**
PRM-43085 *Serial with 2K buffer* **$1249.95**

PRA-27081 *Apple card* **$39.95**
PRA-27082 *Apple cable* **$19.95**
PRA-27087 *TRS-80 cable* **$24.95**
PRA-43081 *2K hi speed serial card* **$169.95**
PRA-43082 *Hi-res graphics ROMs 82A* **$79.95**
PRA-43083 *Hi-graphics ROMs 83A* **$79.95**
PRA-43088 *Tractor option for 82A* **$39.95**
PRA-43080 *Extra ribbons pkg. of 2* **$9.95**

PRINTER PAL - F.M.J. Inc.

Desk top printer stand an paper holder
PRA-99080 *for MX-80, FT, Oki 82A, NEC* **$24.95**
PRA-99100 *for MX-100, Oki 83A & 84* **$29.95**

Terminals

VIDEO TERMINALS - Televideo

Inexpensive full-featured video terminals
VDT-901210 *Televideo 910* **$685.00**
VDT-901213 *Televideo 912* **$775.00**
VDT-901221 *Televideo 920* **$845.00**
VDT-901225 *Televideo 925* **$865.00**
VDT-991250 *Televideo 950* **$1095.00**

Dual Disk Sub-Systems

Disk Sub-Systems - Jade

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never-mar rubber feet, all necessary hardware to mount 2-8" disk drives, power supply, and fan, does not include signal cable.

Dual 8" Sub-Assembly Cabinet
END-000420 *Bare cabinet* **$59.95**
END-000421 *Cabinet kit* **$225.00**
END-000431 *A & T* **$359.95**

8" Sub-Systems - Single Sided, Double Density
END-000423 *Kit w/2 FD100-8Ds* **$975.00**
END-000424 *A & T w/2 FD100-8Ds* **$1175.00**
END-000433 *Kit w/2 SA-801Rs* **$999.95**
END-000434 *A & T w/2 SA-801Rs* **$1195.00**

8" Sub-Systems - Double Sided, Double Density
END-000426 *Kit w/2 DT-8s* **$1224.95**
END-000427 *A & T w/2 DT-8s* **$1424.95**
END-000436 *Kit w/2 SA-851Rs* **$1274.95**
END-000437 *A & T w/2 SA-851Rs* **$1474.95**

Letter Quality Printers

LETTER QUALITY PRINTER - Jade

Uses standard daisy wheels and ribbon cartridges, 16 CPS bi-directional printing, semi-automatic paper loader (single sheet or fan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.
PRD-11001 *Centronics parallel* **$959.95**
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STARWRITER F-10 - C. Itoh

New 40 CPS daisy wheel printer with full 15" carriage, uses standard Diablo print wheels and ribbons, both parallel and serial interfaces included.
PRD-22010 *Starwriter F-10* **$1595.95**

80 CPS LETTER QUALITY - Fujitsu

High speed daisy wheel printer with both RS-232C serial & Centronics parallel interfaces, emulates NEC 5510, Diablo 630, Qume, and will interface to the IBM Personal Computer, features include Z-80 CPU, 16K buffer (48K optional), bi-directional printing, & baud rates up to 19.2K
PRD-86100 *Fujitsu with 16K* **$2895.00**
PRD-86200 *Fujitsu with 48K* **$3195.00**
PRA-86000 *Adjustable tractor* **$190.00**

Jade Bus Probe

THE BUS PROBE - Jade

Inexpensive S-100 Diagnostic Analyzer

So your computer is down. And you don't have an oscilloscope. And you don't have a front panel... You're not alone - most computers have their occasional bad days. But without diagnostic equipment such as an oscilloscope (expensive!) or a front panel (expensive!), it can be very difficult to pinpoint the problem. Even if you have an extender board with a superfast logic probe, you can't see more than one signal at a time. You're stuck, right?

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MSM-104000 ..... $234.95 ea 2 for **$224.95 ea**

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MSM-551002 ..... $324.95 ea 2 for **$298.95 ea**

Shugart SA450 *double-sided double-density 35 track*
MSM-104500 ..... $349.95 ea 2 for **$329.95 ea**

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MSM-551003 ..... $324.95 ea 2 for **$298.95 ea**

Tandon TM100-4 *double-sided double-density 96 TPI*
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MSM-155100 ..... $234.95 ea 2 for **$224.95 ea**

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MPI B-92 *double-sided double-density 77 track*
MSM-155400 ..... $469.95 ea 2 for **$459.95 ea**

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MSF-10851R ..... $554.95 ea 2 for **$529.95 ea**

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MSF-558482 ..... $574.95 ea 2 for **$549.95 ea**

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PLANNER CALC - Target Software

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MMD-5111603	*SS, SD, 16S*	**$29.00**
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MMD-5121003	*SS, DD, 010*	**$31.00**
MMD-5121603	*SS, DD, 16S*	**$31.00**

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MMD-8110103	*SS, SD, 01S*	**$31.00**
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MMD-8110105	*8" SS, SD, 01S*	**$21.95**
MMD-8120105	*8" SS, DD, 01S*	**$32.95**
MMD-8220105	*8" SS, DD, 01S*	**$35.95**

Video Monitors

9" AMBER or GREEN - Jade

High resolution 18 MHz compact video monitors.

VDM-901201	*9" Amber phosphor*	**$149.95**
VDM-901301	*9" Green phosphor*	**$139.95**

HI-RES 12" GREEN - Zenith

15 MHz bandwith 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.

VDM-201201	*List price $189.95*	**$129.95**

12" GREEN SCREEN - NEC

20 MHz bandwidth, P31 phosphor ultra-high resolution video monitor with audio.

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VDC-651212	*Color monitor*	**$389.95**
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Single User System

THREE BOARD SET - SD Systems

4 MHz Z-80A CPU, 64K RAM (optional 256K), serial I/O port, parallel I/O port, double density disk controller, CP/M 2.2 & manual set, system monitor, control & diagnostic software. Includes SBC-200, 64K ExpandoRAM II, Versafloppy II, & CP/M 2.2 - all boards are assembled & tested.

Board set with 64K of RAM		**$1095.00**
Board set with 256K of RAM		**$1295.00**

Apple II Accessories

16K RAM CARD - for Apple II

Expand your Apple to 64K, 1 year warranty

MEX-16700A	*Save $125.00 !!!*	**$74.95**

Z-80 SOFTCARD - MicroSoft

Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M 2.2, & Basic 80.

CPX-30800A	*A & T with software*	**$299.95**

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New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CP/M 2.2, Shugart & Qume compatible

IOD-2700A	*A & T*	**$499.95**

2 MEGABYTES for Apple II

Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

1 MegaByte Package	*Kit*	**$1495.00**
1 MegaByte Package	*A & T*	**$1695.00**
2 MegaByte Package	*Kit*	**$1795.00**
2 MegaByte Package	*A & T*	**$1995.95**

A2 DISK DRIVE - Micro Sci

Inexpensive direct replacement for Apple Disk II, works with Apple II controller as first or second drive.

MSM-123101	*Micro Sci A2*	**$379.95**
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VISION 80 - Vista Computer

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CPS MULTICARD - Mtn. Computer

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Modems

SIGNALMAN - Anchor

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IOM-5600A	*Signalman*	**$98.50**

SMARTMODEM - Hayes

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IOK-1500A	*Hayes Chronograph*	**$218.95**
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Single Board Computer

SUPERQUAD - Adv. Micro Digital

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CPS-30100K	*Kit with workbook*	**$299.95**
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4K AIM-65, 8K Basic, power supply, & enclosure

Special Package Price		**$649.95**

S-100 EPROM Boards

PB-1 - SSM Microcomputer

2708, 2716 EPROM board with on-board programmer.

MEM-99510K	*Kit with manual*	**$154.95**
MEM-99510A	*A & T with manual*	**$219.95**

PROM-100 - SD Systems

2708, 2716, 2732 EPROM programmer with software.

MEM-99520K	*Kit with software*	**$189.95**
MEM-99520A	*A & T with software*	**$249.95**

EPROM BOARD - Jade

16K or 32K uses 2708 or 2716 EPROMs, 1K boundary.

MEM-16230K	*Kit w/o EPROMs*	**$79.95**
MEM-16230A	*A & T w/o EPROMs*	**$119.95**

S-100 Video Boards

SPECTRUM COLOR - CompuPro

Full-function color graphics board, up to 8 colors, 256 x 192 graphics, parallel I/O port, 8K RAM.

IOV-1870A	*A & T*	**$348.95**
IOV-1870C	*CSC*	**$398.95**

MICROANGELO - Scion

Ultra-high-resolution 512 x 480, 256 color or black & white S-100 video board

IOV-1500A	*A & T*	**$999.95**

S-100 MotherBoards

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6 Slot (5¼" x 8⅝")

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MBS-061A	*A & T*	**$59.95**

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MBS-121B	*Bare board*	**$29.95**
MBS-121K	*Kit*	**$69.95**
MBS-121A	*A & T*	**$99.95**

18 Slot (14½" x 8⅝")

MBS-181B	*Bare board*	**$49.95**
MBS-181K	*Kit*	**$99.95**
MBS-181A	*A & T*	**$139.95**

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CPU-70520C *8 MHz 8086 CSC* **$764.95**
CPU-70530A *with 8087 A & T* **$1224.95**
CPU-70530C *with 8087 CSC* **$1455.95**

CPU-Z - CompuPro
2/4 MHz Z80A CPU, 24 bit addressing.
CPU-30500A *2/4 MHz A & T* **$279.95**
CPU-30500C *3/6 MHz CSC* **$374.95**

SBC-200 - SD Systems
4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included.
CPC-30200A *A & T* **$399.95**

THE BIG Z - Jade
2 or 4 MHz switchable Z-80 CPU board with serial I/O, accomodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600.
CPU-30201B *Bare board w/manual* **$35.00**
CPU-30201K *Kit with manual* **$139.95**
CPU-30210A *A & T with manual* **$199.95**

CB-2 - SSM Microcomputer
2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.
CPU-30300K *Kit with manual* **$229.95**
CPU-30300A *A & T with manual* **$274.95**

2810 Z-80 CPU - C.C.S.
2 or 4 MHZ Z-80 CPU with serial I/O port & on-board monitor PROM, front panel compatible.
CPU-30400A *A & T with PROM* **$289.95**

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8" or 5¼" DMA disk controller, single or double density, single or double sided, 10 MHz.
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IOD-1810C *CSC* **$554.95**
SFC-52506580F *8" CP/M 2.2 for Z-80* **$174.95**
SFC-52506586F *8" CP/M 2.2 for 8086* **$299.95**
SFO-54158000F *Oasis single user* **$499.95**
SFO-54158002F *Oasis multi-user* **$849.95**

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IOD-1200A *A & T w/hdwr & sftwr man* **$359.95**
SFC-59002001F *CP/M 2.2 with Double D* **$99.95**

VERSAFLOPPY II - SD Systems
Double density disk controller for any combination of 5¼" and 8" single or double sided, analog phase-locked loop data separator, vectored interrupts, CP/M 2.2 & Oasis compatible, control/diagnostic software PROM included.
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SFC-55009047F *CP/M 2.2 with VF II* **$99.95**

2242 DISK CONTROLLER - C.C.S.
5¼" or 8" double density disk controller with on-board boot loader ROM, free CP/M 2.2 & manual set.
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S-100 Memory Boards

256K RAMDISK - SD Systems
ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, functions as ultra-high speed disk drive when used with optional RAMDISK software, compatible with CP/M, MP/M, Oasis, Cromemco, & most other Z-80 based systems.
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MEM-65128A *128K A & T* **$574.95**
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SFC-55009000F *RAMDISK sftwr CP/M 2.2* **$24.95**

128K RAM 21 - CompuPro
128K x 8 bit or 64K x 16 bit static RAM board, 12 MHz, 24 bit addressing.
MEM-12810A *A & T* **$1609.95**
MEM-12810C *CSC* **$1794.95**

64K EXPANDORAM II - SD Systems
Expandable RAM board from 16K to 64K using 4116 RAM chips.
MEM-16630A *16K A & T* **$344.95**
MEM-32631A *32K A & T* **$364.95**
MEM-48632A *48K A & T* **$384.95**
MEM-64633A *64K A & T* **$399.95**

64K RAM 17 - CompuPro
64K CMOS static RAM board, 10 MHz, low power less than 4 watts, DMA compatible, 24 bit addressing.
MEM-64180A *64K A & T* **$549.95**
MEM-64180C *64K CSC* **$698.95**

64K RAM 16 - CompuPro
32K x 16 bit or 64K x 8 bit low power static RAM board, 10 MHz, 24 bit addressing.
MEM-32180A *RAM 16 A & T* **$598.95**
MEM-32180C *RAM 16 CSC* **$698.95**

64K STATIC RAM - SSM
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MEM-64300A *A & T* **$749.95**

64K STATIC RAM - Mem Merchant
64K static S-100 RAM card, 4 to 16K banks up to 8 MHz.
MEM-64400A *64K A & T* **$594.95**

2065 64K RAM - C.C.S.
4 MHz bank port/bank byte selectable, extended addressing, 16K bank selectable, front panel compatible.
MEM-64565A *64K A & T* **$349.95**

2066 64K RAM - C.C.S.
64K RAM board with bank and block select switching functions for Cromemeco Cromix & Alpha Micro.
MEM-64566A *64K A & T* **$424.95**

MEMORY BANK - Jade
4 MHz S-100 bank selectable expandable to 64K.
MEM-99730B *Bare board w/manual* **$49.95**
MEM-99730K *Kit with no RAM* **$179.95**
MEM-32731K *32K kit* **$199.95**
MEM-64733K *64K kit* **$249.95**
Assembled & Tested ..... **add $50.00**

32K RAM 20 - CompuPro
32K static RAM, up to 10 MHz, disable-able in 4K banks, bank select or 24 bit addressing.
MEM-16180A *16K A & T* **$259.95**
MEM-16180C *16K CSC* **$324.95**
MEM-24180A *24K A & T* **$324.95**
MEM-24180C *24K CSC* **$384.95**
MEM-32185A *32K A & T* **$384.95**
MEM-32185C *32K CSC* **$449.95**

16K STATIC RAM - Mem Merchant
4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.
MEM-16171A *16K A & T* **$154.95**

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Real time clock, three 16 bit interval timers, dual interrupt controllers(15 levels), up to 4K EPROM/RAM, RS-232C serial channel, provision for 9511A/9512 math chip.
IOX-1850A *SS1 A & T* **$359.95**
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IOX-1855A *with 9511 A & T* **$554.95**
IOX-1855C *with 9511 CSC* **$654.95**
IOX-1860A *with 9512 A & T* **$554.95**
IOX-1860C *with 9512 CSC* **$654.95**

INTERFACER 1 - CompuPro
2 serial I/O ports 50-19.2K baud.
IOI-1810A *A & T* **$218.95**
IOI-1810C *CSC* **$288.95**

INTERFACER 2 - CompuPro
3 parallel, 1 serial, & interrupt timer.
IOI-1820A *A & T* **$218.95**
IOI-1820C *CSC* **$288.95**

INTERFACER 3 - CompuPro
5 or 8 channel serial I/O board for interrupt driven multi-user systems up to 250K baud.
IOI-1835A *5 port A & T* **$558.95**
IOI-1835C *5 port CSC* **$628.95**
IOI-1838A *8 port A & T* **$628.95**
IOI-1838C *8 port CSC* **$749.95**

INTERFACER 4 - CompuPro
3 serial, 1 parallel, 1 Centronics parallel.
IOI-1840A *A & T* **$314.95**
IOI-1840C *CSC* **$414.95**

MPX - CompuPro
Multi-user I/O multiplexer & interrupt controller with on-board 8085A-2 CPU & 4K or 16K of RAM.
IOI-1875A *4K MPX A & T* **$444.95**
IOI-1875C *4K MPX CSC* **$534.95**
IOI-1880A *16K MPX A & T* **$584.95**
IOI-1880C *16K MPX CSC* **$674.95**

I/O-4 - SSM Microcomputer
2 serial I/O ports plus 2 parallel I/O ports.
IOI-1010B *Bare board w/manual* **$35.00**
IOI-1010K *Kit with manual* **$179.95**
IOI-1010A *A & T with manual* **$249.95**

I/O-5 - SSM Microcomputer
Two serial & 3 parallel I/O ports, 110-19.2K Baud
IOI-1015A *A & T* **$289.95**

I/O-8 - SSM Microcomputer
Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems
IOI-1018A *A & T* **$469.95**

MPC-4 - SD Systems
Intelligent 4-port serial I/O card, on-board Z-80A, 2K RAM, 4K PROM area, on-board firmware, fully buffered, vectored interrupts, four CTC channels, add to SD Board set for powerful multi-user system
IOI-1504A *A & T w/software* **$495.00**

2719 2 SER & 2 PAR - C.C.S.
Two RS-232C serial I/O ports plus two 8 bit parallel I/O ports.
IOI-1080A *A & T with manual* **$349.95**

2710 4 PORT SERIAL - C.C.S.
Four RS-232C serial I/O ports with full handshaking.
IOI-1060A *A & T with manual* **$319.95**

2830 6 PORT SERIAL - C.C.S.
Six asynchronous RS-232C serial I/O ports with programmable baud rates.
IOI-1040A *A & T with manual* **$529.95**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

Circle 41 on Reader Service card.

7400

SN7400N	.20	SN7472N	.29	SN74156N	.79
SN7401N	.20	SN7473N	.35	SN74157N	.69
SN7402N	.25	SN7474N	.35	SN74160N	.89
SN7403N	.25	SN7475N	.49	SN74161N	.89
SN7404N	.25	SN7476N	.35	SN74162N	.89
SN7405N	.29	SN7479N	5.00	SN74163N	.89
SN7406N	.35	SN7480N	.50	SN74164N	.89
SN7407N	.35	SN7482N	.99	SN74165N	.89
SN7408N	.29	SN7483N	.69	SN74166N	1.25
SN7409N	.29	SN7485N	.89	SN74167N	2.79
SN7410N	.25	SN7486N	.35	SN74170N	1.95
SN7411N	.29	SN7489N	1.75	SN74172N	4.95
SN7412N	.35	SN7490N	.49	SN74173N	1.39
SN7413N	.49	SN7491N	.59	SN74174N	.99
SN7414N	.69	SN7492N	.45	SN74175N	.89
SN7416N	.29	SN7493N	.45	SN74176N	.79
SN7417N	.29	SN7494N	.69	SN74177N	.79
SN7420N	.25	SN7495N	.69	SN74179N	1.49
SN7421N	.29	SN7496N	.69	SN74180N	.79
SN7422N	.45	SN7497N	3.00	SN74181N	2.25
SN7423N	.29	SN74100N	1.49	SN74182N	.79
SN7425N	.29	SN74104N	.89	SN74184N	2.49
SN7426N	.29	SN74105N	.89	SN74185N	2.49
SN7427N	.25	SN74107N	.35	SN74190N	1.25
SN7428N	.49	SN74109N	.39	SN74191N	1.25
SN7430N	.25	SN74116N	1.95	SN74192N	.89
SN7432N	.29	SN74121N	.39	SN74193N	.89
SN7437N	.25	SN74122N	.55	SN74194N	.89
SN7438N	.40	SN74123N	.59	SN74195N	.69
SN7439N	.25	SN74125N	.49	SN74196N	.89
SN7440N	.20	SN74126N	.49	SN74197N	.89
SN7441N	.89	SN74132N	.75	SN74198N	1.49
SN7442N	.59	SN74136N	.75	SN74199N	1.49
SN7443N	1.10	SN74141N	.99	SN74221N	1.25
SN7444N	1.10	SN74142N	3.25	SN74251N	.99
SN7445N	.89	SN74143N	3.49	SN74276N	1.95
SN7446N	.79	SN74144N	3.49	SN74279N	.79
SN7447N	.69	SN74145N	.79	SN74283N	1.49
SN7448N	.79	SN74147N	1.95	SN74284N	3.95
SN7450N	.20	SN74148N	1.29	SN74285N	3.95
SN7451N	.20	SN74150N	1.25	SN74365N	.69
SN7453N	.20	SN74151N	.69	SN74366N	.69
SN7454N	.20	SN74152N	.69	SN74367N	.69
SN7459A	.25	SN74153N	.79	SN74368N	.69
SN7460N	.20	SN74154N	1.25	SN74390N	1.49
SN7470N	.29	SN74155N	.79	SN74393N	1.49

74LS

74LS00	.29	74LS92	.75	74LS192	1.15
74LS01	.29	74LS93	.75	74LS193	1.15
74LS02	.29	74LS95	.99	74LS194	1.15
74LS03	.29	74LS96	1.15	74LS195	1.15
74LS04	.35	74LS107	.45	74LS197	1.19
74LS05	.35	74LS109	.45	74LS221	1.19
74LS08	.35	74LS112	.45	74LS240	1.49
74LS09	.35	74LS113	.49	74LS241	1.49
74LS10	.35	74LS114	.49	74LS242	1.49
74LS11	.39	74LS122	.49	74LS243	1.49
74LS12	.35	74LS123	1.25	74LS244	1.49
74LS13	.59	74LS125	.59	74LS245	2.95
74LS14	.99	74LS126	.59	74LS247	1.19
74LS15	.35	74LS132	.99	74LS248	1.19
74LS20	.35	74LS133	.89	74LS249	1.19
74LS21	.35	74LS136	.49	74LS251	.99
74LS22	.35	74LS138	.89	74LS253	.99
74LS26	.35	74LS139	.89	74LS257	.89
74LS27	.35	74LS151	.89	74LS258	.69
74LS28	.35	74LS153	.89	74LS260	.69
74LS30	.35	74LS154	1.75	74LS266	.69
74LS32	.35	74LS155	.89	74LS273	1.95
74LS33	.59	74LS156	1.15	74LS279	.89
74LS37	.45	74LS157	.89	74LS283	.89
74LS38	.39	74LS158	.89	74LS290	.99
74LS40	.35	74LS157	.89	74LS293	.99
74LS42	.89	74LS158	.89	74LS298	1.25
74LS47	.89	74LS160	1.15	74LS352	1.29
74LS48	1.15	74LS161	1.15	74LS353	1.29
74LS49	1.15	74LS162	1.15	74LS365	.69
74LS51	.35	74LS163	1.15	74LS366	.69
74LS54	.35	74LS164	1.15	74LS367	.69
74LS55	.35	74LS165	1.15	74LS368	.69
74LS73	.45	74LS168	1.19	74LS373	1.95
74LS74	.45	74LS169	1.19	74LS374	1.95
74LS75	.59	74LS170	1.95	74LS375	.89
74LS76	.45	74LS173	.99	74LS386	.69
74LS78	.49	74LS174	.99	74LS393	2.49
74LS83	.89	74LS175	.99	74LS399	2.49
74LS85	1.25	74LS181	2.95	74LS670	2.49
74LS86	.49	74LS190	1.25	81LS95	1.95
74LS90	.69	74LS191	1.25	81LS97	1.95

74S

74S00	.45	74S124	3.95	74S243	3.25
74S02	.45	74S133	.55	74S244	3.25
74S03	.45	74S134	.69	74S251	1.45
74S04	.55	74S135	1.19	74S253	1.45
74S05	.55	74S136	1.75	74S257	1.35
74S08	.50	74S138	1.35	74S258	1.35
74S09	.50	74S139	1.35	74S260	.79
74S10	.45	74S140	.79	74S280	2.95
74S11	.45	74S151	1.35	74S287	3.25
74S15	.45	74S153	1.35	74S288	2.75
74S20	.45	74S157	1.35	74S373	3.49
74S22	.45	74S158	1.35	74S374	3.49
74S30	.45	74S157	1.35	74S387	2.95
74S32	.55	74S158	1.35	74S471	10.95
74S38	1.25	74S160	2.95	74S472	10.95
74S40	.50	74S174	1.59	74S473	10.95
74S51	.45	74S175	1.59	74S474	12.95
74S64	.50	74S188	2.95	74S475	12.95
74S65	.50	74S194	1.95	74S570	5.95
74S74	.75	74S195	1.95	74S571	5.95
74S86	.79	74S196	1.95	74S572	9.95
74S112	.79	74S240	2.95	74S573	9.95
74S113	.79	74S241	2.95	74S940	3.15
74S114	.79	74S242	3.25	74S941	3.15

CA–LINEAR

CA3010H	.99	CA3060N	3.25	CA3089N	3.75
CA3013H	2.15	CA3080H	1.25	CA3096N	3.95
CA3023H	3.25	CA3081N	2.00	CA3130H	1.39
CA3035H	2.49	CA3082N	2.00	CA3140H	1.25
CA3039H	1.35	CA3083N	1.60	CA3160H	1.25
CA3046N	1.30	CA3086N	.85	CA3401N	.59
CA3059N	3.25			CA3600N	3.50

CD–CMOS

CD4000	.39	CD4041	1.49	CD 4098	2.49
CD4001	.39	CD4042	.99	CD4506	.75
CD4002	.39	CD4043	.89	CD4507	.99
CD4006	1.19	CD4044	.89	CD4508	3.95
CD4007	.25	CD4045	1.79	CD4510	1.39
CD4009	.49	CD4046	1.79	CD4511	1.29
CD4010	.49	CD4047	2.50	CD4512	1.49
CD4011	.39	CD4048	1.35	CD4514	3.95
CD4012	.25	CD4049	.49	CD4515	2.95
CD4013	.49	CD4050	.69	CD4516	1.49
CD4014	1.39	CD4051	1.19	CD4518	1.79
CD4015	1.19	CD4052	1.19	CD4519	.89
CD4016	.59	CD4053	1.19	CD4520	1.29
CD4017	1.19	CD4054	2.95	CD4526	1.79
CD4018	.99	CD4055	1.19	CD4528	1.79
CD4019	.49	CD4056	2.95	CD4529	1.95
CD4020	1.19	CD4059	9.95	CD4543	2.79
CD4021	1.39	CD4060	1.49	CD4562	11.95
CD4022	1.19	CD4066	.79	CD4566	2.79
CD4023	.29	CD4068	.39	CD4583	2.49
CD4024	.79	CD4069	.45	CD4584	.75
CD4025	.23	CD4070	.55	CD4723	1.95
CD4026	2.95	CD4071	.49	CD4724	1.95
CD4027	.69	CD4072	.49	MC14409	17.95
CD4028	.89	CD4073	.39	MC14410	18.95
CD4029	1.49	CD4075	.39	MC14411	15.95
CD4030	.49	CD4076	1.39	MC14412	15.95
CD4034	3.49	CD4078	.55	MC14419	7.95
CD4035	.99	CD4081	.39	MC14433	15.95
CD4040	1.49	CD4082	.39	MC14538	2.49
		CD4093	.99	MC14541	1.95

OPTO ELECTRONICS — DISPLAY LEDS

A-AMBER R-RED G-GREEN Y-YELLOW C-CLEAR

DIFFUSED BI-COLOR/TRI-STATE

Part No.	1-99	100+
XC56R1	1.25	1.00

POINT SOURCE (RED)

Part No.	1-99	100+
RC3-02	$.11.00	9.17 ea.

DIFFUSED

Part No.	1-99	100+
XC56R	$.11.00	9.17 ea.
XC56Y	4/ 1.00	.20
XC56G	4/ 1.00	.20

DIFFUSED

Part No.	1-99	100+
XC22R	$.11.00	9.17
XC22G	4/1.00	.20
XC22Y	4/1.00	.20

DIFFUSED

Part No.	1-99	100+
XC11R	$.11.00	9.17
XC11G	4/1.00	.20
XC11Y	4/1.00	.20
XC11C	4/1.00	.20

WIDE ANGLE DIFFUSED

Part No.	1-99	100+
XC56WR	$.11.00	9.17
XC56WG	4/1.00	.20
XC56WY	4/1.00	.20
XC56WC	4/1.00	.20

DIFFUSED

Part No.	1-99	100+
XC56R	$.11.00	9.17
XC56RG	4/1.00	.20
XC56RY	4/1.00	.20
XC56RC	4/1.00	.20

POINT SOURCE

Part No.	1-99	100+
XC56WR	$.11.00	9.17
XC56WG	4/1.00	.20
XC56WY	4/1.00	.20
XC56WC	4/1.00	.20

DIFFUSED

Part No.	1-99	100+
XC56WR	$.11.00	9.17
XC56WG	4/1.00	.20
XC56WY	4/1.00	.20
XC56WC	4/1.00	.20

DIFFUSED TRIANGLE

Part No.	1-99	100+
XC56R	$.11.00	9.17
XC56G	4/1.00	.20
XC56Y	4/1.00	.20

DIFFUSED RECTANGULAR

Part No.	1-99	100+
XC56R	$.11.00	9.17
XC56G	4/1.00	.20
XC56Y	4/1.00	.20

LED Mounting Hardware

Mounts in panels up to .125" thick. Drill .257" diameter hole (F Drill). Can be used with XC22, XC111, XC525, XC564 and XC566 Series (from .160" to .200 Dia.) Black plastic clip and ring.

Part No.	8-99	100+
LMH-200	.8/$1.00	.08 ea.

Part No.	Size	Color	Description	Price
MAN 1	.270	Red	C.A. (LHDP)	$2.95
MAN 2	.320	Red	5x7 Alphanumeric (TIL305)	4.95
MAN 52	.300	Green	C.A. (LHDP)	.99
MAN 54	.300	Green	C.C. (LHDP)	.99
MAN 72	.300	Red	C.A. (LHDP)	.75
MAN 74	.300	Red	C.C. (RHDP)	1.25
NSN 74L	.300	Red	C.C. (LHDP)	.99
MAN 82	.300	Yellow	C.A. (LHDP)	.99
MAN 84	.300	Yellow	C.C. (LHDP)	.99
MAN 3620	.300	Orange	C.A. (LHDP)	.99
MAN 3630	.300	Orange	C.C. (LHDP)	.99
MAN 4610	.400	Orange	C.A. (RHDP)	.99
MAN 6610	.560	Orange	C.A. (RHDP) 2 Digit	.99
MAN 6630	.560	Orange	C.A. (± 1) 1½ Digit	.99
MAN 6640	.560	Orange	C.C. (RHDP) 2 Digit	.99
MAN 6650	.560	Orange	C.C. (± 1) 1½ Digit	.99
MAN 6660	.560	Orange	C.A. (RHDP)	.99
MAN 6710	.560	Red	C.A. (RHDP) 2 Digit	.99
MAN 6740	.560	Red	C.C. (RHDP) 2 Digit	.99
MAN 6760	.560	Red	C.C. (± 1) 1½ Digit	.99
DL 34M	.110	Red	C.C. (4 Digit Bubble) RHDP	.49
DLG 304	.300	Orange	C.A. (LHDP)	1.25
DLG 307	.300	Orange	C.C. (LHDP)	1.25
DLG 500	.500	Green	C.C. (RHDP)	1.25
DLG 507	.500	Green	C.C. (LHDP)	1.25
DL 704	.300	Red	C.C. (RHDP)	1.25
DL 707	.300	Red	C.A. (LHDP)	1.25
DL 747	.630	Red	C.A. (LHDP)	1.49
DL 750	.630	Red	C.C. (LHDP)	1.49
FND 350	.362	Red	C.A. (RHDP)	.75
FND 357	.362	Red	C.C. (RHDP) FND 359	.75
FND 500	.500	Red	C.C. (RHDP) FND 503	.99
FND 507	.500	Red	C.A. (RHDP) FND 510	.99
TIL 306	.270	Red	Numerical Display w/Logic	10.95
TIL 311	.270	Red	4x7 Hexadecimal w/Logic	10.95
5082-7300	.600	Red	4x7 Numeric (RHDP)	$22.00
5082-7302	.600	Red	4x7 Numeric (LHDP)	22.00
5082-7304	.600	Red	Over Flo (± 1) for 5082-7300 42	19.95
5082-7340	.600	Red	4x7 Hexadecimal (0-9/A-F)	22.50
5082-7432	.110	Red	C.C. (2-Digit/3-Bubble)	.29
HDSP-3401	.800 20mm	Red	C.A. (RHDP)	1.50
HDSP-3403	.800 20mm	Red	C.C. (RHDP)	1.50
HDSP-3406	.800 20mm	Red	C.C. (RHDP) ±1 Over Flo	1.50

Many Other Displays Available — Send for New Catalog

OPTO-ISOLATORS

H11C3	SCR Output Opto-Isolator	$1.19
LIT-1	Single Chan. 20% CTR, 2500V (MCT-2/4N25)	.89
4N28	Single Chan. 10% CTR, 500V (Photo-Transistor)	.69
4N33	Single Chan. 500% 1600V (Photo-Darlington)	.79
MOC3010	Optically Isolated Triac Driver	1.25

LITRONIX-NATIONAL Stick Display Sale

LIMITED QUANTITY!!

LED NUMERIC ARRAYS

PART NO.	DIGIT SIZE (RED)	FORMAT	DRIVE Comm. Cathode/Comm. Anode	OVERALL SIZE	PRICE	SALE PRICE!
NSA186	.100 (9 Bubble Stick)	8.8.8.8.8.	C.C. 6 Digit Multiplexed	2"L x .72"H x .27"D	$ .99	$2.99
NSA198	.100 (9 Bubble Stick)	8.8.8.8.8.8.8.8.8.	C.C. 9 Digit Multiplexed	2"L x .72"H x .27"D	.99	$2.99
NSA298	.100 (9 Bubble Stick)	8.8.8.8.8.8.8.8.8.	C.A. 9 Digit Multiplexed	1.98"L x .72"H x .27"D	.99	$2.99
NSA1150	.100 (9 Bubble Stick)	8 88: 88	C.C. 5 Digit Multiplexed	2"L x .72"H x .27"D	.49	$2.99

MULTI-DIGIT LED NUMERIC DISPLAYS

*Standard Socked Items						SALE PRICE!
NSN373	.3 No Decimal		8 8	C.C. 2 Digit Direct	.80"L x .80"H x .225"D	$ .89	$1.79
NSN374	.3 No Decimal		8 8	C.A. 2 Digit Direct	.80"L x .80"H x .225"D	.79	$1.99
NSN502	.5 No Decimal		8 8	C.A. 2 Digit Direct	1.46"L x 1.14"H x .32"D (1/16" pins)	.99	$1.49
NSN781	.7		8.8.	C.C. 2 Digit Multiplexed	1.2"L x 1.25"H x .3"D	1.19	$1.95
NSB2100	.3		8.8.M.8.8.+.8.8.8.8.	C.C. 6 Digit (10 Spaces)	4"L x .80"H x .250"D	.75	$2.89
NSB3001	.3		8.8.8.8.	C.A. 4 Digit Multiplexed	1.59"L x .85"H x .25"D (1/16" pins)	.75	$2.89
NSB3362	.3		+.8.8.8.8.	C.A. 3½ Digit Multiplexed	1.60"L x .80"H x .225"D	.99	$1.49
NSB3411	.3		M.88: 88	C.A. 4 Digit – Colon/PM Indicator	1.9/16"L x 13/16"H x 3/16"D	.99	$1.19
NSB3052	.3		*88 88 88	C.C. 6 Digit – AM/PM, Failure Ind.	2"L x 1.10"H x 7/32"D	2.95	$3.95
NSB3864	.3		8.8.8.8.8.8.	C.C. 8 Digit Multiplexed	3"L x 1/32"H x 3/16"D	2.95	$3.95
NSB3881*	.3		8.8.8.8.	C.C. 4 Digit Multiplexed	1.59"L x .80"H x .225"D	2.95	$4.95
NSB3882*	.3		8.8.8.8.	C.A. 4 Digit Multiplexed	1.59"L x .80"H x .225"D	2.95	$4.95
NSB5362*	.5		+.8.8.8.	C.A. 3½ Digit Multiplexed	1.99"L x 1.00"H x .28"D	3.49	$5.95
NSB5441	.5		*88.88	C.C. 4 Digit – AM/PM, Colon Ind.	3.00"L x 1.10"H x .282"D	2.95	$3.95
NSB5881*	.5		8.8.8.8.	C.C. 4 Digit Multiplexed	1.99"L x 1.00"H x .280"D	3.49	$5.95
NSB5882*	.5		8.8.8.8.	C.A. 4 Digit Multiplexed	1.99"L x 1.00"H x .280"D	3.49	$5.95
NSB5918	.5		+.8.8.8.8.	C.A. 3½ Digit Multiplexed	3.00"L x 1.10"H x .282"D	2.49	$3.49
NSB5922	.5		8.8.8.8.8.	C.A. 5 Digit Multiplexed	3.00"L x 1.10"H x .282"D	2.95	$3.49
NSB7603	.7		8.8.8.8.8.	C.C. 5 Digit Multiplexed/Direct	2.80"L x 1.36"H x .282"D (3/4" pins)	2.95	$4.95
DL2300	.3		8.8.	C.C. 2 Digit Multiplexed	13/16" x 7/8" x 1/4"	.79	$2.99
DLG2536	.6 (Green)		8.8.	C.A. 2 Digit Multiplexed	1-5/16" x 1-1/2" x 5/16"	.89	$2/1.19
DL3130	1.0		8.8.8.	C.A. 3 Digit Multiplexed	2-3/4" x 1-13/16" x 5/16"	2.25	$3.49
DL4900	.5		8.8.8.8.	C.C. 4 Digit, MPX, Colon	3-3/16" x 1-1/4" x 5/16"	1.95	$2.95
DL4507	.5		8.8.8.8.	C.C. 4 Digit, MPX, Colon	3-3/16" x 1 x 5/16"	1.75	$2.95
DLG4507	.5 (Green)		8.8.8.8.	C.C. 4-Digit Non-Multiplexed	3-3/16" x 1 x 5/16"	4.95	$7.95
DL4609	.5		8.8.8.8.	C.C. 4 Digit Multiplexed	2" x 1-5/16" x 5/16"	1.49	$1.95
DL4620A	.5		8.8.8.8.	C.A. 4 Digit Non-Multiplexed	3-3/16" x 1" x 5/16"	2.49	$2.95

COMPUTER GRADE CAPACITORS

MFD	WVDC	PRICE
250	150	1.95
1,000	200	2.49
1,250	3	.99
1,500	25	1.95
1,800	50	2.95
2,000	10	2.95
2,100	200	2.95
2,250	15	3.95
2,300	33	2.95
2,500	15	2.95
3,000	25	1.95
3,600	40	3.95
4,500	50	3.95
5,000	25	3.49
6,100	40	2.49

16 Sale!

MFD	WVDC	PRICE
7,000	60	4.95
10,000	15	2.95
10,000	16	3.95
11,000	19	4.95
13,000	16	2.95
14,000	13	2.95
14,000	35	3.95
18,000	10	3.95
20,000	20	2.95
21,000	15	3.95
22,000	15	4.95
23,000	7	1.95
23,000	10	2.95
23,000	20	3.95
24,000	20	2.95

16 Sale!

MFD	WVDC	PRICE
27,000	10	2.95
32,500	25	5.95
40,000	25	5.95
42,000	10	4.95
42,000	16	5.95
45,000	6	5.95
52,000	20	5.95
58,000	10	5.95
58,000	20	5.95
65,000	10	7.95
72,000	15	7.95
80,000	15	9.95
90,000	10	8.95
120,000	15	10.95
160,000	10	8.95

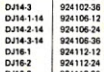
16 Sale!

OVER 200 OTHER VALUES AVAILABLE — BUY ONE, THE SECOND UNIT IS 1¢ MORE

LOW PROFILE (TIN) SOCKETS

	1-24	25-49	50-100
8 pin LP	.17	.16	.15
14 pin LP	.20	.19	.18
16 pin LP	.22	.21	.20
18 pin LP	.29	.28	.27
20 pin LP	.34	.32	.30
22 pin LP	.37	.36	.35
24 pin LP	.38	.37	.36
28 pin LP	.45	.44	.43
36 pin LP	.60	.59	.58
40 pin LP	.63	.62	.61

SOLDERTAIL (GOLD) STANDARD



	1-24	25-49	50-100
8 pin SG	.39	.35	.31
14 pin SG	.49	.45	.41
16 pin SG	.54	.49	.44
18 pin SG	.59	.53	.48
24 pin SG	.79	.75	.69
28 pin SG	1.10	1.00	.90
36 pin SG	1.65	1.40	1.26
40 pin SG	1.75	1.59	1.45

SOLDERTAIL STANDARD (TIN)

	1-24	25-49	50-100
14 pin ST	.27	.25	.24
16 pin ST	.30	.27	.25
18 pin ST	.35	.32	.30
24 pin ST	.49	.45	.42
28 pin ST	.99	.90	.81
36 pin ST	1.39	1.26	1.15
40 pin ST	1.59	1.45	1.30

WIRE WRAP SOCKETS (GOLD) LEVEL #3

	1-24	25-49	50-100
8 pin WW	.59	.54	.49
10 pin WW	.69	.63	.58
14 pin WW	.79	.73	.67
16 pin WW	.85	.77	.70
18 pin WW	.99	.90	.81
20 pin WW	1.19	1.08	.99
22 pin WW	1.49	1.35	1.23
24 pin WW	1.39	1.26	1.14
28 pin WW	1.69	1.53	1.38
36 pin WW	2.19	1.99	1.79
40 pin WW	2.29	2.09	1.89

Custom Jumpers!

JUMPER AND CABLE ASSEMBLIES

Custom Cables!

STANDARD DIP JUMPERS

All jumpers use low profile dip plugs with heavy duty pins for repeated disconnect applications.

JAMECO Part No.	AP Cross-Reference	No. Pins	Description	Wire Length	Price
DJ14-1	924102-12	14	single end	12"	$1.79
DJ14-2	924102-24	14	single end	24"	2.05
DJ14-3	924102-36	14	single end	36"	2.35
DJ14-1-14	924106-12	14	double end	12"	3.20
DJ14-2-14	924106-24	14	double end	24"	3.49
DJ14-3-14	924106-36	14	double end	36"	3.79
DJ16-1	924112-12	16	single end	12"	1.85
DJ16-2	924112-24	16	single end	24"	2.19
DJ16-3	924112-36	16	single end	36"	2.59
DJ16-1-16	924116-12	16	double end	12"	3.35
DJ16-2-16	924116-24	16	double end	24"	3.69
DJ16-3-16	924116-36	16	double end	36"	4.05
DJ24-1	924122-12	24	single end	12"	2.69
DJ24-2	924122-24	24	single end	24"	3.39
DJ24-3	924122-36	24	single end	36"	3.95
DJ24-1-24	924126-12	24	double end	12"	4.79
DJ24-2-24	924126-24	24	double end	24"	5.29
DJ24-3-24	924126-36	24	double end	36"	5.89

JAMECO Part No.	AP Cross-Reference	No. Pins	Description	Wire Length	Price
DJ40-1	924132-12	40	single end	12"	5.89
DJ40-2	924132-24	40	single end	24"	6.79
DJ40-3	924132-36	40	single end	36"	7.69
DJ40-1-40	924136-12	40	double end	12"	10.95
DJ40-2-40	924136-24	40	double end	24"	11.89
DJ40-3-40	924136-36	40	double end	36"	12.79

STANDARD DB25 SERIES CABLES

Now you can order DB25 P or S connectors with the cable necessary to fit your application. Choose from our standard flat cable in 4-foot lengths. **Call today.**

STANDARD CABLES

Part No.	Cable Length	Connectors	Price
DB25P-4	4 feet	1-DB25P	$ 9.95 ea.
DB25S-4	4 feet	1-DB25S	10.95 ea.
DB25P-4-P	4 feet	2-DB25P	16.95 ea.
DB25P-4-S	4 feet	1-DB25P/1-DB25S	17.95 ea.
DB25S-4-S	4 feet	2-DB25S	18.95 ea.

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6% Sales Tax
Postage — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sale Flyer!

Spec Sheets — 25¢ each
Send 88¢ Postage for your *FREE* 1982 JAMECO CATALOG
Prices Subject to Change

NEW 1982 CATALOG

Mail Order Electronics - Worldwide

Jameco ELECTRONICS

NEW! Telex Number Telex 176043

1355 SHOREWAY ROAD, BELMONT, CA 94002
7/82 *PHONE ORDERS WELCOME — (415) 592-8097*

INTERSIL

*Evaluation Kits

Part No.	Function	Price
7045IPI	CMOS Precision Timer	14.95
7045EV/Kit*	Stopwatch Chip, XTL	24.95
7106CPL	3½ Digit A/D (LCD Drive)	16.96
7106EV/Kit*	IC, Circuit Board, Display	34.95
7107CPL	3½ Digit A/D (LED Drive)	15.95
7107EV/Kit*	IC, Circuit Board, Display	29.95
7116CPL	3½ Digit A/D LCD Dis. HLD.	18.95
7117CPL	3½ Digit A/D LED Dis. HLD.	17.95
7201IDR	Low Battery Volt Indicator	2.25
7205IPG	CMOS LED Stopwatch/Timer	12.95
7205EV/Kit*	Stopwatch Chip, XTL	19.95
7206CJPE	Tone Generator	5.15
7206CEV/Kit*	Tone Generator Chip, XTL	12.95
7207AIPD	Oscillator Controller	6.50
7207AEV/Kit*	Freq. Counter Chip, XTL	13.95
7208IPI	Seven Decade Counter	17.95
7209IPA	Clock Generator	3.95
7215IPG	4 Func. CMOS Stopwatch CKT	13.95
7215EV/Kit*	4 Func. Stopwatch Chip, XTL	19.95
7216AIJI	8-Digit Univ. Counter C.A.	32.00
7216CIJI	8-Digit Freq. Counter C.A.	26.95
7216DIPI	8-Digit Freq. Counter C.C.	21.95
7217IJI

UTIC Mini Stereo AM/FM Receiver

WITH HEADPHONES — For Joggers, Cyclists, Skaters & Sports Events

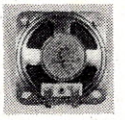
FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3⅛" x 4⅞" x 1". Wt. 6 oz.

Model 2830 List Price $89.95 ..... **$34.95**

SPEAKERS

2¼" Round — 8 Ohm
.25 Watt (4" Leads)
Size: 2¼" x ¾"

Part No.	Price
A0201	$1.25 or 2/1.98



2½" Square — 16 Ohm
.25 Watt (4 mount. holes)
Large Ceramic Magnet
Size: 2⅝" x 2⅝" x ¾"

Part No.	Price
SF-25016	.$1.39 or 2/2.98

National Semiconductor RAM SALE

STATIC RAMS

MM2114N-2 4K (200NS) ..... **$2.49 each**
(8 EACH $16.95/lot) (100 EACH $195.95/lot)

MM2114N-2L 4K (200NS) Low Power .... **$2.95 each**
(8 EACH $19.95/lot) (100 EACH $225.00/lot)

MM2147N 4K (70NS) ..... **$4.95 each**
(8 EACH $34.95/lot) (100 EACH $419.95/lot)

MM6116P-4 16K (200NS) ..... **$9.95 each**
(8 EACH $69.95/lot) (100 EACH $795.00/lot)

DYNAMIC RAMS

MM4164N-20 64K (200NS) ..... **$9.95 each**
(8 EACH $69.95/lot) (100 EACH $795.00/lot)

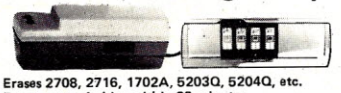
MM5261N 1K (300NS) **8/1.95**

MM5262N 2K (365NS) **8/1.95**

MM5290N-2 16K (150NS) 4116 ..... **$2.95 each**
(8 EACH $19.95/lot) (100 EACH $225.00/lot)

MM5290N-4 16K (250NS) 4116 ..... **$1.95 each**
(8 EACH $14.95/lot) (100 each $175.00/lot)

EPROM Erasing Lamp

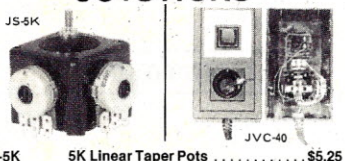


- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

UVS-11EL Replacement Bulb $16.95

UVS-11E **$79.95**

JOYSTICKS



JS-5K	5K Linear Taper Pots	$5.25
JS-100K	100K Linear Taper Pots	$4.95
JS-150K	150K Linear Taper Pots	$4.75
JVC-40	40K (2) Video Controller in case	$4.95

5¼" Mini-Floppy Disc Drive

Pertec Computer Corp.

FOR TRS-80 MODEL I, III (Industry Standard)

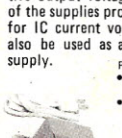
Features single or double density. Recording mode: FM single, MFM double density. Power: +12VDC (±0.6V) 1.6 amps max., 5VDC (±0.25V) 0.8 amps max. Unit as pictured at left (does not incl. case, power supply or cables). 30-page data book included. Weighs 3½ pounds. Size: 5¼"W x 8"D x 3¼"H

Limited Quantity!

Part No.	Price
FD200	$179.95
	Single-sided, 40 tracks, 250K bytes capacity
FD250	$199.95
	Double-sided, 35 tracks, 438K bytes capacity

NEW! JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.



FEATURES:
- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2"w x 5-1/16"L x 2"H

JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95

(Picture not shown but similar in construction to above)

JE200 Reg. Power Supply Kit (5VDC, 1 amp) . . $14.95
JE205 Adapter Brd. (to JE200) ±5,±9 & ±12V. $12.95
JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. $19.95

MICROPROCESSOR COMPONENTS

8080A/8080A SUPPORT DEVICES

INS8080A	CPU	4.95
DP8212	8-Bit Input/Output	3.25
DP8214	Priority Interrupt Control	5.95
DP8216	Bi-Directional Bus Driver	3.49
DP8224	Clock Generator/Driver	3.95
DP8226	Bus Driver	3.49
DP8228	System Controller/Bus Driver	4.95
DP8238	System Controller	5.95
INS8243	I/O Expander for 48 Series	9.95
INS8250	Asynchronous Comm. Element	16.95
DP8251	Prog. Comm. I/O (USART)	6.95
DP8253	Prog. Interval Timer	8.95
DP8255	Prog. Peripheral I/O (PPI)	5.95
DP8257	Prog. DMA Control	9.95
DP8259	Prog. Interrupt Control	9.95
DP8275	Prog. CRT Controller	39.95
DP8279	Prog. Keyboard/Display Interface	9.95
DP8303	System Timing Element	6.95
DP8304	8-Bit Bi-Directional Receiver	3.95
DP8307	8-Bit Bi-Directional Receiver	3.95
DP8308	8-Bit Bi-Directional Receiver	3.95
DP8310	Octal Latched Peripheral Driver	5.25
DP8311	Octal Latched Peripheral Driver	5.25

6800/6800 SUPPORT DEVICES

MC6800	MPU	7.95
MC6802CP	MPU with Clock and RAM	14.95
MC6810API	128x8 Static RAM	4.95
MC6821	Peripheral Inter. Adapt (MC6820)	7.49
MC6828	Priority Interrupt Controller	17.95
MC6830L8	1024x8-Bit ROM (MC68A30-8)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6852	Synchronous Serial Data Adapter	6.95
MC6860	0-600bps Digital MODEM	10.95
MC6862	2400bps Modulator	12.95
MC6880A	Quad 3-State Bus Trans. (MC8T26)	2.25

MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK3880N) (2MHz)	11.95
Z80A (780-1)	CPU (MK3880N-4) (4MHz)	13.95
CDP1802	CPU	19.95
2650	MPU	16.95
IDM2901A	DC CPU—4-Bit Slice (Com. Temp. Grade)	19.95
MC6809	MPU w/Clock (64K Bytes Memory)	11.95
INS8035N-6	MPU—8-Bit (6MHz)	7.95
INS8039N-6	CPU—Sgl. Chip 8-Bit (128 bytes RAM)	9.95
INS8040N-6	CPU (256 Bytes RAM)	24.95
INS8070N	CPU—64 Bytes RAM	24.95
INS8073N	CPU w/Basic Micro Interpreter	29.95
F8085	CPU	9.95
TMS9900JL	MPU—16-Bit	39.95

1173AN-1 30 Tune Musical MPU Chip 8.95

SHIFT REGISTERS

MM500H	Dual 25-Bit Dynamic	.50
MM503H	Dual 50-Bit Dynamic	.50
MM506H	Dual 100-Bit Static	.50
MM510H	Dual 64-Bit Accumulator	.50
MM1402N	256-Bit Dynamic	2.95
MM5013N	1024-Bit Dynamic/Accumulator	1.95
MM5016N	500/512-Bit Dynamic	1.95
MM5024N	Octal 80-Bit	9.95
MM5035N	Octal 80-Bit	9.95
2504V(1404A)	1024-Bit Dynamic	1.95
2511N	MOS Dual 200-Bit Static	.99
2522V	Dual 132-Bit Static	2.95
2524V	512-Bit Dynamic	.99
3341PC	Fifo (Dual 80)	6.95

DATA ACQUISITION

DC10	Mostek DC/DC Convert. +5V to -9V	$2.95
MC3470P	Floppy Disc Read AMP System	4.95
MC1408L7	7-Bit D/A Converter (DAC0807LCN)	4.95
MC1408L8	8-Bit D/A Converter (DAC0808LCN)	5.75
AF100-1CN	Universal Active Filter 2.5%	5.95
AF121-1CJ	Touch Tone Low Band Filter	19.95
AF122-1CJ	Touch Tone High Band Filter	19.95
LM308CH	Super Gain Op Amp	1.15
LM334Z	Constant Current Source	1.30
LM335Z	Temperature Transducer	1.40
LF356N	JFET Input Op Amp	1.10
LF398N	Sample & Hold Amplifiers	3.95
LM399H	Temp. Comp. Prec. Ref. (.5ppm/C°)	5.00
ADC0804LCN	8-Bit A/D Converter (1 LSB)	4.95
DAC0806LCN	8-Bit D/A Converter (0.78% Lin.)	2.25

DATA ACQUISITION (CONTINUED)

ADC0809CCN	8-Bit A/D Converter (8-Ch. Multi.)	5.25
ADC0817CCN	8-Bit A/D Converter (16-Ch. Multi.)	10.95
DAC1000LCN	10-Bit D/A Conv. Micro. Comp. (0.05%)	13.95
DAC1008LCN	10-Bit D/A Conv. Micro. Comp. (0.20%)	8.95
DAC1020LCN	10-Bit D/A Converter (0.05% Lin.)	8.49
DAC1022LCN	10-Bit D/A Converter (0.20% Lin.)	5.95
DAC1222LCN	12-Bit D/A Converter (0.20% Lin.)	9.95
CD4051N	8-Channel Multiplexer	1.19
AY-5-1013	30K BAUD UART	6.95

RAM'S

1101	256x1 Static	1.49
1103	1024x1 Dynamic	.99
2101 (8101)	256x4 Static	3.95
2102	1024x1 Static	1.79
21L02	1024x1 Static	1.95
2111 (8111)	256x4 Static	3.95
2112	256x4 Static MOS	4.95
2114	1024x4 Static 450ns	2.25
2114L	1024x4 Static 450ns Low Power	2.49
2114-2	1024x4 Static 200ns	2.49
2114L-2	1024x4 Static 200ns Low Power	2.95
74S200	256x1 Static	6.95
4116N-4 (UPD416)	16K Dynamic 250ns (MM5290N-4)	1.95
4116N-3	64K Dynamic 200ns	14.95
MM2147N	4096x1 Fast 70ns	4.95
5101	256x4 Static	7.95
MM5261	1024x1 Dynamic Fully Decoded	.99
MM5262	2Kx1 Dynamic	.49
MM5280/2107	4096x1 Dynamic	4.95
MM5290N-2 (4116)	16K Dynamic 150ns (UPD416C-3)	2.95
MM5298J-3A	8K Dyn. 200ns (lower ½ of MM5290J)	1.95
HM6116-4	16K (2Kx8) Static 200ns	14.95
82S25	64 Bit RAM (16x40C)	3.49
UPD414/MK4027	4K Dynamic 16-pin	4.95
TMS4044-45NL	4K Static	9.95
TMS4045	1024x4 Static	9.95

PROMS/EPROMS

1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	4.95
TMS2716	16K EPROM (-5V, +5V, +12V)	9.95
2716(Intel/2516)TI	16K EPROM (Single +5V)	8.95
2732Intel TI	32K EPROM	17.95
2758	8K EPROM (450ns) (Single +5V)	7.49
2764Q	64K EPROM (Hitachi HN462764)	49.95
5203	2048 PROM	14.95
82S23(74S188)	32x8 PROM (Open Collector)	3.95
82S115	4095 Bipolar PROM	14.95
82S123(74S288)	32x8 Tri-State Bipolar PROM	3.95
82S185	8K PROM	16.95

— Over 30 More PROMS Listed in Our Catalog —

ROM'S

2513(2140)	Character Generator (Upper Case)	9.95
2513(3021)	Character Generator (Lower Case)	9.95

NMOS READ ONLY MEMORIES

MCM66710P	128x9x7 ASCII Shifted w/Greek	13.50
MCM66740P	128x9x7 Math Symbol & Pictures	13.50
MCM66750P	128x9x7 Alpha, Control Char. Gen.	13.50

MICROPROCESSOR MANUALS

M-Z80	User Manual	7.50
M-CDP1802	User Manual	7.50
M-2650	User Manual	5.00

SPECIAL FUNCTION

DS0025CN	Dual MOS Clock Driver (SMZ)	3.50
DS0026CN	Dual MOS Clock Driver (SMZ)	1.95
INS1771N-1	Floppy Disc Controller	24.95
INS2651N	Communication Chip	19.95
MM58167N	Microprocessor Real Time Clock	8.95
MM58174N	Microprocessor Compatible Clock	11.95
COP402N	Microcontroller with 64-Digit RAM and Direct LED Drive	6.95
COP402MN	Microcontroller with 64-Digit RAM & Direct LED Drive w/N Buss Int.	7.49
COP470N	32-Seg.VAC Fluor. Driver (20-pin pkg.)	3.25

TELEPHONE/KEYBOARD CHIPS

AY-5-9100	Push Button Telephone Dialer	14.95
AY-5-9200	Repertory Dialer	14.95
AY-5-9500	CMOS Clock Generator	4.95
AY-5-2376	Keyboard Encoder (88 keys)	11.95
HD0165-5	Keyboard Encoder (16 keys)	7.95
74C922	Keyboard Encoder (16 keys)	5.49
74C923	Keyboard Encoder (20 keys)	5.75
MM53190N	Push Button Pulse Dialer	7.95
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- 115V 50/60Hz
- For Apple users

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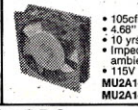
Muffin® Fan



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- 115V 50/60Hz 14W Wt. 17 oz.

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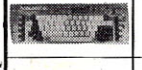
MU2A1-N New ..... $14.95 ea.

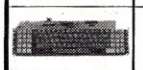
KEYBOARDS

MICRO SWITCH 69-KEY KEYBOARD *Limited Quantity!*
Uses AMI SW20350K Chip. Size: 16¾"L x 5¼"W x 1⅝"H Metal Frame. Light and dark grey key caps (no data sheet).
Part No. KB69SD12-2 ..... **$19.95 each**



DATANETICS 74-KEY KEYBOARD *Limited Quantity!*
Uses EA20134 Chip (Electronic Array). Size: 16¾"L x 5½"W x 1⅞"H. White, black, blue, grey key caps. Data sheets not available.
Part No. KB354 ..... **$29.95 each**

STACKPOLE 62-KEY ASCII KEYBOARD *Standard Stocked Item!*
SPST Switching (Mechanical). Size: 13"L x 3¼"W x 1½"H. Grey key caps. Data sheets are available.
Part No. K-62 ..... **$34.95 each**
(ASCII Encloded Keyboard Kit — JE610K ..... $79.95)



MICRO SWITCH 88-KEY KEYBOARD
Uses SD 25010K Chip (AMI). Size: 18¼"L x 5¾"W x 1⅝"H. Dark and light gray key caps. Used in a Diablo 1640 Terminal (schematic avail.)
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POWER SUPPLY — 5VDC @ 1 AMP REGULATED Transaction Tech
Output +5VDC @ 1 amp (also +30VDC) reg. Input 115VAC 60Hz. Two-tone (black/beige) self-enclosed case. 6 foot, 3 conductor black power cord. Size: 6½"W x 7"D x 2¼"H — Wt. 3 lbs.
Part No. PS51194 ..... **$19.95 each**

POWER SUPPLY — 5VDC @ 1 AMP REGULATED B Industries
Output +5VDC @ 1 amp, + 36-42VDC Adjusted. 400mA or less, 30VAC (Isolated) @ 1.5 amp. Input 115VAC 60Hz. Circuit breaker re-set button. Black self-enclosed case with 4 rubber feet. 6 foot, 3 conductor black power cord. On/off switch. Size: 6¾"W x 7¾"D x 3⅞"H — Wt. 7 lbs.
Part No. PS407D ..... **$24.95 each**

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Output: +5VDC @ 30A, +12VDC @ 2A, -12VDC @ 4A and +24VDC @ 3A. Input: 115VAC, 7A, 220VAC, 3.5A. Regulation: ± .15% line and load combined. Ripple: 10MV peak to peak (3MV RMS). Overvoltage protection: 5V, + 12V, -12V. Overcurrent protection included. Size: 15½"L x 6"H x 11⅞"D — Wt. 40 lbs.
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30006 Above (3) 30001,3,5 as set $24.95/lot

010400	**Intel Component Data Catalog** Full data sheets for Intel's products incl. memory devices, microproc., peripherals & indust./mil. products (1328 pages)	$14.95
205610	**Intel Peripheral Design Handbook** Full data sheets, appl. notes for Intel peripheral device components (644 pages)	$9.95

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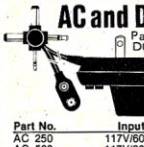

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+5 VOLTS TO -9 VOLTS

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The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and −12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3½"H x 14½"W x 8¾"D

JE610/DTE-AK (After assembled as pictured above) ... **$124.95**

JE610 Kit 62-Key Keyboard, PC Board, & Components (no case). .... **$ 79.95**

K62 62-Key Keyboard (Keyboard only) ... **$ 34.95**

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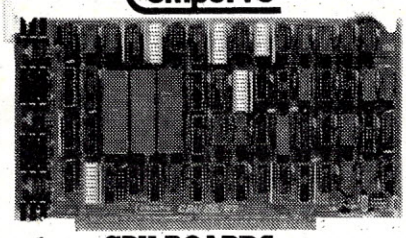

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Part No.	Description	List Price	Our Price
KGGBT186A	A&T 8MHz 8086 only	$695.00	$ 625.00
KGGBAT186C	CSC 10MHz 8086 only	$850.00	$765.00
KGGBT186A87	A&T with 8087 option	$1295.00	$1225.00
KGGBT186C87	CSC with 8087 option*	$1550.00	$1456.00

*8087 requires slower clock speeds

DUAL PROCESSOR 8085-8088

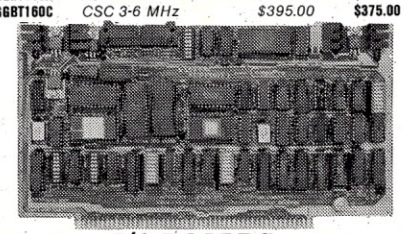
6 or 8 MHz Provides true 16 Bit Power with a standard 8 bit S-100 bus

KGGBT1612A	A&T 6Mhz	$425.00	$399.00
KGGBT1612C	CSC 6/8 MHz	$525.00	$498.00

CPU-Z Z80 CPU

2/4 MHz Z80 CPU 24 Bit Addressing

KGGBT160A	A&T	$295.00	$280.00
KGGBT160C	CSC 3-6 MHz	$395.00	$375.00



I/O BOARDS

SYSTEM SUPPORT 1 MULTIFUNCTION BOARD

Serial port (software prog. baud), 4K EPROM or RAM provision, 15 levels of interrupt, real time clock, optional math processor

Part No.	Description	List Price	Our Price
KGGBT162A	Assembled & Tested	$399.00	$360.00
KGGBT162C	CSC	$495.00	$460.00
KGGBT8231	Math Chip		$195.00
KGGBT8232	Math Chip		$195.00
KGGBT162AM1	A&T with 8231 Math Chip		$555.00
KGGBT162CM1	CSC w/8231 Math Chip		$655.00
KGGBT162AM2	A&T w/8232 Math Chip		$555.00
KGGBT162CM2	CSC w/8232 Math Chip		$655.00

MPX CHANNEL BOARD

I/O Multiplexer, using 8085A-2 CPU on board with 4K RAM

KGGBT166A4	Assembled & Tested	$495.00	$445.00
KGGBT166C4	CSC	$595.00	$535.00
	With 16K RAM		
KGGBT166A16	Assembled & Tested	$649.00	$585.00
KGGBT166C16	CSC	$749.00	$675.00

INTERFACER 1

Two Serial I/O

KGGBT133A	Assembled & Tested	$249.00	$219.00
KGGBT133C	CSC	$324.00	$298.00

INTERFACER 2

Three parallel, one serial I/O board

KGGBT150A	Assembled & Tested	$249.00	$219.00
KGGBT150C	CSC	$324.00	$289.00

INTERFACER 3

Eight channel multi-use serial I/O board

KGGBT1748A	Assembled & Tested	$699.00	$629.00
KGGBT1748C	CSC 200 hr. 8 Port	$849.00	$750.00
KGGBT1745A	Assembled & Tested	$599.00	$559.00
KGGBT1745C	CSC 200hr. 5 port	$699.00	$629.00

NEW!

INTERFACER 4

Three Serial, 1 Parallel, 1 Centronics Parallel

KGGBT187A	Assembled & Tested	$350.00	$315.00
KGGBT187C	CSC	$450.00	$415.00

SPECTRUM COLOR GRAPHICS

Color Graphics board with Parallel I/O

KGGBT144A	Assembled & Tested	$399.00	$349.00
KGGBT144C	CSC	$449.00	$339.00
KGGBT2D	Sublogic Universal Graphics Interpreter Software		$35.00

S-100 MOTHERBOARDS

Active termination, 6-12-20 Slot

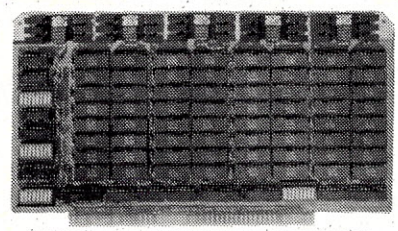
KGGBT153A	A&T 6 slot, 2 lbs.	$140.00	$126.00
KGGBT153C	CSC 6 slot, 2 lbs.	$190.00	$175.00
KGGBT154A	A&T 12 slot, 3 lbs.	$175.00	$155.00
KGGBT154C	CSC 12 slot, 3 lbs.	$240.00	$220.00
KGGBT155A	A&T 20 slot, 4 lbs.	$265.00	$235.00
KGGBT155C	CSC 20 slot, 4 lbs.	$340.00	$310.00

ACTIVE TERMINATOR

Allows older S-100 motherboards to run faster and quieter

KGGBT106A	Assembled & Tested	$59.50

CompuPro™



STATIC MEMORY BOARDS

RAM 20 - 32K STATIC RAM

RAM 20 10 MHz, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

Part No.	Description	List Price	Our Price
KGGBT164AA8	8K A&T	$210.00	$190.00
KGGBT164AC8	8K CSC	$280.00	$260.00
KGGBT164AA16	16K A&T	$285.00	$260.00
KGGBT164AC16	16K CSC	$355.00	$325.00
KGGBT164AA24	24K A&T	$355.00	$325.00
KGGBT164AC24	24K CSC	$425.00	$385.00
KGGBT164AA32	32K A&T	$425.00	$385.00
KGGBT164AC32	32K CSC	$495.00	$450.00

CMOS STATIC RAM

For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of **BYTE**

RAM 17 - 64K CMOS STATIC RAM

RAM 17, 10 MHz, 2 Watt, DMA Compatible 24 Bit Addressing

KGGBT175A64	64K A&T	$599.00	$550.00
KGGBT175C64	64K CSC	$750.00	$699.00

RAM 16 - 32K x 16 BIT CMOS STATIC RAM

8 and/or 16 Bit

(816) RAM 16 10 MHz, 32K x 16 or 64K x 8 IEEE/696 16 Bit 2 Watt, 24 Bit Addressing

KGGBT180A	64K A&T	$650.00	$599.00
KGGBT180C	64K CSC	$750.00	$699.00

NEW! RAM 21 - 128K STATIC RAM

(816) RAM 21 12MHz, 128K x 8 or 64K x 16 IEEE/696 8 or 16 Bit 1.2 Amps, 24 Bit Addressing

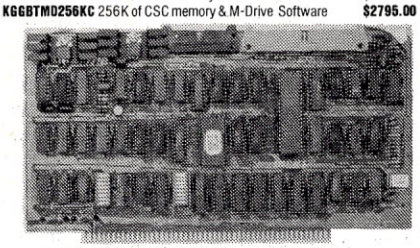
KGGBT190A	128K A&T	$1695.00	$1610.00
KGGBT190C	128K CSC	$1895.00	$1795.00

M-DRIVE SOLID STATE DISK DRIVE, 3500% FASTER! (816)

Not Really, But the Next Best Thing for CompuPro 8085/88 Users. Call for Detail on M-Drive.

M-Drive requires a 6MHz CPU 8085/88 dual processor, Disk 1 DMA disk controller and System Suport 1 Multifunction Board

KGGBTMD128K	128K of A&T memory & M-DriveSoftware	$1198.00
KGGBTMD128KC	128K of CSC memory & M-Drive Software	$1398.00
KGGBTMD256KA	256K of A&T memory & M-DriveSoftware	$2395.00
KGGBTMD256KC	256K of CSC memory & M-Drive Software	$2795.00



DISK CONTROLLERS

DISK 1 FLOPPY CONTROLLER

Fast DMA, Soft Sector, Controls 8" or 5¼" Single or Double Density. OUR BEST!

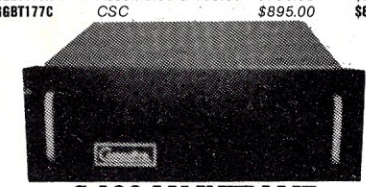
KGGBT171A	A&T	$495.00	$450.00
KGGBT171C	CSC	$595.00	$555.00
KGGBTCPM80*	CP/M 2.2 for Z80/8085 with manuals & BIOS 8" S/D disk		$175.00
KGGBTCPM86	CP/M for 8086 with manuals & BIOS 8" S/D disk		$300.00
KGGBTOAS8S	Oasis 8 bit single user 8"S/D disk		$500.00
KGGBTOAS8M	Oasis 8 bit multiuser, 8" S/D disk		$850.00

NEW!

DISK 2/SELECTOR CHANNEL HARD DISK CONTROLLER

Fast DMA 2 board set.Controls 4 Shugart 4000 series or Fujitsu 2300 type drives

KGGBT177A	Assembled & Tested	$795.00	$750.00
KGGBT177C	CSC	$895.00	$850.00

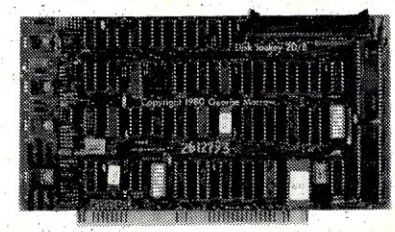


S-100 MAINFRAME

110V 60Hz CVT Mainframe uses famous 20 slot COMPUPRO Motherboard. 55 lbs.

KGGBTENC20RM	20 Slot Rack Mount	$895.00	$825.00
KGGBTENC200K	20 Slot Desk Top	$825.00	$760.00

MORROW DESIGNS



FLOPPY DISK CONTROLLERS & SUBSYSTEMS

DISK JOCKEY 2D FLOPPY CONTROLLER

Memory mapped controller handles 4 8" drives, single or double density

Part No.	Description	List Price	Our Price
KGMDSDJ2208	A&T w/CP/M™ 2.2	$399.00	$375.00

DISCUS 2D & DISCUS 2+2 SUBSYSTEMS

Each subsystem includes DJ/2B controller 8" double density drives with cabinet, power supply, CP/M™ 2.2 and Microsoft Basic

SINGLE SIDED - DISCUS 2D

KGMDSF1218	1 Drive	30 lbs.	$1095.00	$ 950.00
KGMDSF1228	2 Drive	48 lbs.	$1875.00	$1675.00

DOUBLE SIDED - DISCUS 2+2

KGMDSBF812	1 Drive	30 lbs.	$1395.00	$1250.00
KGMDSBF822	2 Drive	48 lbs.	$2495.00	$2200.00

DISK JOCKEY/DMA FLOPPY CONTROLLER

DMA Controller supports 4 soft-sectored 8" drives and 4 10 sector 5¼" drives simultaneously. On board Z80A

KGMDSDJDMA	A&T w/CP/M™ 2.2	$495.00	$450.00

DISK JOCKEY DMA SUBSYSTEMS

Each subsystem includes DJ/DMA controller, 8" double-density drives or 5¼" 48 TPI drives, cabinet, power supply, CP/M™ 2.2 and Microsoft BASIC

SINGLE SIDED DISCUS 2D/DMA

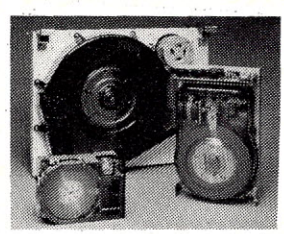
KGMDSDF811	1 Drive	30 lbs.	$1195.00	$1050.00
KGMDSDF821	2 Drive	48 lbs.	$1975.00	$1775.00

DOUBLE SIDED DISCUS 2+2/DMA

KGMDSDF812	1 Drive	30 lbs.	$1495.00	$1325.00
KGMDSDF822	2 Drive	48 lbs.	$2575.00	$2295.00

DOUBLE SIDED - DISCUS MINI-FLOPPY/DMA

KGMDSDF5124	1 Drive	17 lbs.	$ 995.00	$895.00
KGMDSDF5224	2 Drive	32 lbs.	$1695.00	$1525.00



NEW!

S-100 5-26 MB HARD DISK SUBSYSTEMS

5 - 10 Mb DMA SUBSYSTEMS

Each subsystem includes DMA Hard Disk Controller, Seagate ST506 5 Mb or ST412 10 Mb 5¼" Hard Disk, Cabinet, power supply, CP/M™2.2 and Microsoft BASIC.

KGMDSDMAM*	*Software supplied on 8" IBM 3740 disk with blank I/O and INSTALL program*
KGMDSDMAM*2B	*Software configured for Morrow DJ/2B controller and Mult I/O as console*
KGMDSDMAM*DMA	*Software configured for Morrow DJ/DMA controller and Mult I/O as console*
KGMDSDMAM*NS	*Software supplied on 5¼"10 sector North Star disk with blank I/O and INSTALL Program*

*Replace * in above part numbers with* **5** *for 5Mb Subsystems or* **10** *for 10Mb Subsystems.*

DISCUSM5	- 5Mb Subsystems	$2195.00	$1975.00
DISCUSM10	- 10Mb Subsystems	$3195.00	$2875.00

(order by part numbers listed above)

DISCUS HDC 20-26 Mb SUBSYSTEMS

Each subsystem includes HDCA3 I/O mapped controller, Shugart SA4008 14" 26Mb or Fujitsu 2308 8" 20Mb Hard Disk, cabinet, power supply, CP/M™2.2 & Microsoft BASIC.

KGMDSHDC20	Discus M20 A&T	$4795.00	$3995.00
KGMDSHDC26	Discus M26 A&T	$4495.00	$3895.00

I/O BOARDS

MULTI I/O

Three Serial, Two Parallel

KGMDSMB3200	Assembled & Tested	$359.00	$325.00

SWITCHBOARD

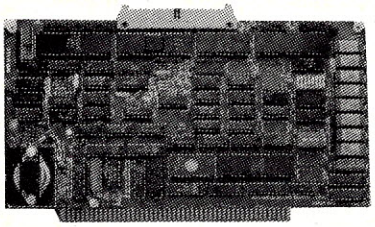
Two serial I/O, four parallel I/O, one status port, one strobe port

KGMDSSB2411		$299.00	$269.00

PRIORITY ONE ELECTRONICS

Circle 277 on Reader Service card.

ADVANCED MICRO DIGITAL CORPORATION

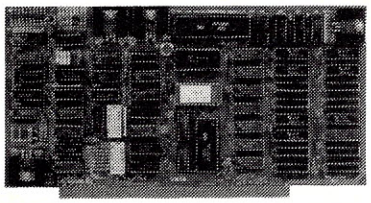


SUPERQUAD - ADVANCED MICRO DIGITAL AT LAST, A FULL S-100 SYSTEM ON A SINGLE BOARD!

● IEEE S-100 Bus Compatible ● Z80A CPU @ 4MHz ● Floppy Disk Controller, Single & Double Density (Supports up to 4 disk drives 5¼" or 8") ● 64Kb Memory, 16K Bank Selectable ● S-100 Extended Address A16-23 ● 2 Serial and 2 Parallel I/O Ports ● 2K or 4K of Shadow EPROM ● Real Time Interrupt Clock ● One Year Warranty ● Runs with CP/M, MP/M, CP/NET ● All of These Features on a Single Standard Size S-100 Board.

Part No.	Description	List Price	Our Price
KGMADSDC1	A&T w/Asych RS232 ports	$875.00	$795.00
KGMADPS1	1 Asych adapter board required for each serial port used		$ 30.00

SSM



VIDEO AND I/O

VB 3 - HIGH RESOLUTION VIDEO

80 x 25 or 50 character video display Memory Mapped, Parallel Keyboard port

KGSSMVB3A24	80 x 24 A&T	$499.00	$440.00
KGSSMVB3UP	80 x 50 Line Upgrade		$ 39.00

VB 2 - I/O MAPPED 64 x 16 DISPLAY

I/O Mapped Video Board, with Parallel Keyboard port 64 x 16

KGSSMVB24A	Assembled & Tested	$269.00	$229.00

VB1B MEMORY MAPPED 64 x 16 DISPLAY

Memory Mapped Video Board 64 x 16 character display or 64 x 16 graphics display

KGSSMVB1A	Assembled & Tested	$242.00	$220.00

I/O 4

Two serial I/O, two parallel I/O

KGSSMI04A	Assembled & Tested	$290.00	$260.00

NEW!

I/O 5

2 Serial, 3 parallel Including 1 Centronics

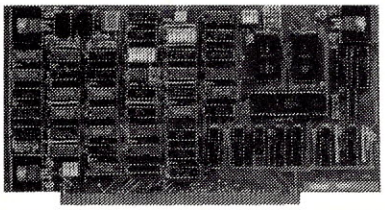
KGSSMI051	Assembled & Tested	$329.00	$309.00

NEW!

I/O 8

8 Port Serial I/O with Timer

KGSSMI08A	Assembled & Tested	$550.00	$495.00



CPU, RAM & PROM

CB2 Z80 CPU

2/4 MHz will accept 2716, or 2732, or RAM

KGSSMCB2A	Assembled & Tested	$299.00	$275.00
KGSSMZ80M	SSM Z80 Monitor		$ 89.00

MB10A 16/8K 8/16 BIT STATIC RAM

16K byte /8K word, 24 bit extended, addressing, "M write," Phantom disable, addressable in 4K blocks

KGSSMMB10A	Assembled & Tested	$299.00	$275.00

MB8A 1K/16K EPROM BOARD

1K/16K 2708 EPROM board, disable in 1K increments

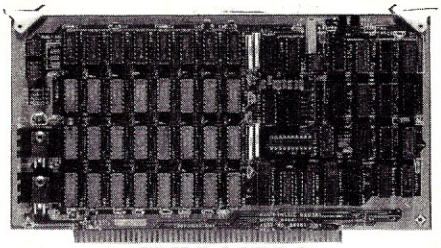
KGSSMMB8AA	Assembled & Tested	$179.00	$159.00

PBI PROM PROGRAMMER

Programs 2708 or 2716's, operates as a 4K/8K EPROM BOARD AS WELL

KGSSMPB1A	Assembled & Tested	$265.00	$220.00

California Computer Systems



CPU BOARDS

2810 Z80 SBC CPU

2/4 MHz Z80A CPU with RS232C Serial I/O Port complete with Monitor PROM for 2422 Disk Controller

Part No.	Description	List Price	Our Price
KGCCS2810A	Assembled & Tested		$300.00

2820 Z80 DMA CPU

4MHz Z80 with 2 RS232C Serial Ports, Centronics Parallel Port, separate data and status ports and DMA Daisy Chain Capability

KGCCS2820	Assembled & Tested		$595.00

I/O BOARDS

2830 - 6 PORT SERIAL

Six Asynchronous RS232C Ports using three Z-80 DARTS. Programmable baud rates.

KGCCS2830	Assembled & Tested		$550.00

2710 4 PORT SERIAL

4 Full handshaking RS232 ports and optional 2K ROM

KGCCS271001	Assembled & Tested		$325.00

2719 2 SERIAL & 2 PARALLEL

2 RS232C ports, 2 8 bit parallel ports & optional 2K ROM

KGCCS271901	Assembled & Tested		$360.00

2720 4 PORT PARALLEL

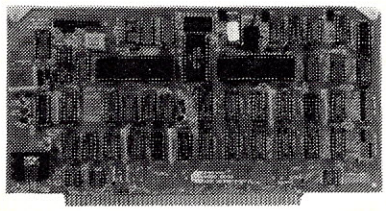
4 8 bit parallel ports and optional 2K ROM

KGCCS272001	Assembled & Tested		$275.00

2422 FLOPPY DISK CONTROLLER

I/O Mapped, controls 8", single or 5¼" double density A&T with CPM™2.2 8" S.D.

KGCCS2422A	Assembled & Tested		$425.00



MEMORY BOARDS

2065 64K DYNAMIC MEMORY BOARD

64K 4MHz, Z80 or 8080 compatible, bank select for memory expansion to 512K, DMA compatible.

KGCCS2065	Assembled & Tested	$375.00	$350.00

2066 BANK SWITCH DYNAMIC MEMORY

64K Memory with bank and block select switching functions for Cromemco Cromix™ & Alpha Microsystems

KGCCS2066	Assembled & Tested	$450.00	$425.00

2116 16K STATIC RAM

16K 4MHz using 2114 RAMs. Maybe divided into 4K blocks Cromemco & Alpha Microsystems compatible

KGCCS21163	Assembled & Tested		$295.00

2032 32K STATIC RAM

32K 4MHz using 2114s. Divided into 4 8K blocks. Bank-port/bank-byte scheme compatible with Cromemco and Alpha Microsystems.

KGCCS2032	Assembled & Tested		$500.00

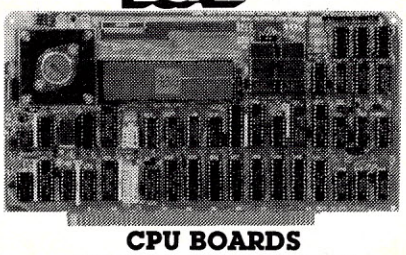
S-100 MAINFRAME

12-slot motherboard with removable termination card

KGCCS220001	Office Cream	35 lbs.	$575.00
KGCCS220002	Blue	35 lbs.	$575.00

SEND $1.00 TODAY FOR THE NEW, FULL COLOR SPRING 1982 ENGINEERING SELECTION GUIDE!

DUAL



ONE

CPU BOARDS

CPU/68000 - 8MHz 68000 CPU

16 bit 68000 CPU with on board ROM containing MACSBUG Monitor or Motorola 68541 Memory Management Unit (MMU).

Part No.	Description	List Price	Our Price
KGDULCPU68000	A&T with Monitor	$1195.00	$1075.00
KGDULCPU68000M	A&T with MMU	$1495.00	$1395.00

MEMORY BOARDS

DMEM256KP-256K DYNAMIC MEMORY MODULE

256Kb with byte parity error detection for 8 or 16 bit computers

KGDULDMEM256	256K A&T	$1495.00	$1395.00

CMEM NONVOLATILE CMOS MEMORY

Nonvolatile CMOS memory with 3-10 year battery backup on board.

KGDULCMEM8	8K A&T	$695.00	$629.00
KGDULCMEM16	16K A&T	$795.00	$725.00
KGDULCMEM32	32K A&T	$995.00	$940.00

2716/2732 EPROM BOARD WITH 16 BIT DATA PATHS

Designed to hold 32Kb of 2716 type or 64Kb of 2732 type EPROMs, or ROMs for read only use with 16 bit CPU systems.

KGDULEPROM32	2716 EPROM Board A&T	$295.00	$280.00
KGDULEPROM64	2732 EPROM Board A&T	$295.00	$280.00

REAL TIME & DATA AQUISITION

AIM 12-12 BIT A/D CONVERTER

A/D input module with 12 bit accuracy, 32 input channels and optional instrumentation amplifier

KGDULAIM12	A&T with Instrumentation Amp.		$745.00
KGDULAIM12B	A&T without Instrumentation Amp.		$660.00

AOM 12-12 BIT D/A CONVERTER

D/A output module, 4 channels, 12 bit accuracy. Optional VIC420 industrial output module (4-20Ma), 4 channels, used in conjunction with AOM12.

KGDULAOM12	Assembled & Tested	$675.00	$640.00
KGDULVIC420	Assembled & Tested	$675.00	$640.00

CLK24-NONVOLATILE CLOCK/CALENDAR

Day, date, hours, minutes, seconds, and 3-5 year battery backup on board. Read or write directly from I/O port. Jumperable for 64Hz UNIX® or real time applications.

KGDULCLK24C	A&T w/64Hz Interrupt	$300.00	$285.00

SOFTWARE

DIGITAL RESEARCH

KGDIRCPM	CP/M 2.2 Control Program/ Microcomputers	$150.00
KGDIRMAC	MAC Macro Assembler	$ 90.00
KGDIRRMAC	RMAC Relocating MAC	$200.00
KGDIRSID	SID Symbolic Instruction Debugger	$100.00
KGDIRTEX	TEX Text Formatter	$100.00
KGDIRDES	DESPOOL Background Print Utility	$ 50.00
KGDIRCB80	CBASIC Programming Language	$150.00
KGDIRCB86	CBASIC-86 Programming Language	$325.00

MICROPRO INTERNATIONAL

KGMOSWDSTR	Wordstar Version 3.0	$300.00
KGMOSMLMRG	Mail Merge	$100.00
KGMOSSPSTR	Spell Star	$150.00
KGMOSCALSTR	Calc Star	$200.00
KGMOSDATSTR	Data Star	$200.00
KGMOSSUPSET	Supersort	$150.00

SORCIM

KGSORSCAL	SUPERCALC a Superior Electronic Worksheet	$295.00
KGSORACTI	ACT I 8080/Z80 Assembler	$175.00
KGSORACTII	ACT II 8086/8088 Assembler	$175.00
KGSORTRNS	TRANS 8086/8088 Translator	$125.00
KGSORPM80	PASCAL/M REL4 8080/8085/Z-80	$395.00
KGSORPM86	PASCAL/M 8086	$495.00

MICROSOFT

KGMOSBAS80	BASIC-80 Version 5.X Extended Disk Basic	$300.00
KGMCPBASC	BASIC Compiler Version 5.X	$395.00
KGMOSMFT	FORTRAN-80	$500.00

VISA master charge

PRIORITY ONE ELECTRONICS ©

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NEDA MEMBER MITA

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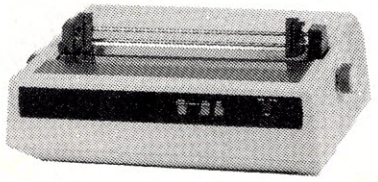
PRIORITY ONE ELECTRONICS

Circle 277 on Reader Service card.

FUJITSU & NEC LETTER QUALITY PRINTERS FROM SELLUM



Interfaces: ● RS232C and Current Loop ● Centronics type parallel interface ● IEEE/488 All are DIP switch selectable.
Personality Protocols: ● NEC5510 ● DIABLO 630 ● QUME Sprint 9 ● IBM Personal Computer ● ATARI (Centronics 737).
Special Features: ● Z80 CPU ● 12K ROM ● Standard 16K Buffer ● Optional 48K Buffer ● 50 - 19.2K baud ● Micro-coded alarm differentiates error conditions with pulse combinations ● Intelligent bi-directional printing with logic seeking ● Complete word processing features ● Self test ● Auto reprint ● Auto clear error ● Proportional spacing ● Supports Automatic justification ● Complete Vector plotting routines ● Sheet feeder mode allows easy interface to most mechanical sheet feeders ● 6 month warrantee ● Quiet - 60db ● Front panel forms control ● Universal power supply 115/220V 50/60 Hz.

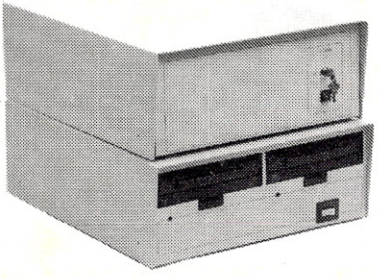
80 CPS USING THE FUJITSU SP830

Part No.	Description	List Price	Our Price
KGSLMF86	*Intelligent Printer*	*$3495.00*	**$2995.00**
	OPTIONS		
KGSLMF86VFT	*Vertical forms tractor*		**$200.00**
KGSLMF8648K*	*48K RAM buffer*		**$400.00**
	Call for pricing on sheet feed options		

55 CPS USING THE NEC 7700

KGSLMN77	*Intelligent Printer*	*$3295.00*	**$2895.00**
	OPTIONS		
KGSLMN77VFT	*Vertical Forms Tractor*		**$ 230.00**
KGSLMN77BDFT	*Bidirectional Forms Tractor*		**$ 400.00**
KGSLMN77CSF	*NEC Cut Sheet Feeder*		**$1595.00**
KGSLMN77CSF2	*Twin Cut Sheet Feeder*		**$2150.00**
KGSLMN7748K*	*48K RAM Buffer*		**$ 400.00**
	**Must be ordered with the printer*		
	INTERFACE CABLES		
KGCPAM572	*Centronics IBM/NEC Cable*		**$80.00**
KGSCDB251	*RS232C Serial Cable*		**$60.00**
	Call for other cables not listed		

Para Dynamics



18 SLOT S-100 MAINFRAME

CVT Power Supply, forced air cooling; security lock 120 or 220V AC at 50 or 60Hz+8V@20A, ±16@3.5

KGPDN2018D	*Desk Top*	*$799.00*	**$699.00**
KGPDN2018R	*Rack Mount*	*$849.00*	**$749.00**

8 SLOT S-100 MAINFRAME WITH CUTOUTS FOR 2 5¼" DISK DRIVES

+5@5A, -5@500MA, +8@15A, +12@6A, +16@2, -16@2

KGPDN2508D	*Desk Top*	*$899.00*	**$789.00**
KGPDN2508R	*Rack Mount*	*$949.00*	**$839.00**

DISK DRIVE FACILITY

Accommodates two 8" floppy drives, of Shugart, Qume, or similar design and dimensions. 110 or 220V AC at 50 or 60Hz CVT power.

KGPDN2200D	*Desk Top*	*$659.00*	**$579.00**
KGPDN2200R	*Rack Mount*	*$679.00*	**$595.00**

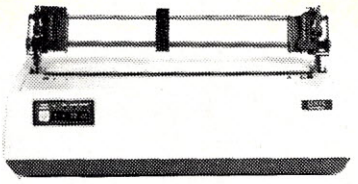
PRONTO

Free standing cabinet. Will accept 2, 8" Floppy disks and 1, 8" Rigid disk. 18 slot card cage will accept the double height 10" x 10" S-100 cards (Alpha Micro and others) CVT Power Supply.

+24@7A, +16@2.2A, -16@3.5A, +8@20A, +5@5A

KGPDN2818	*PRONTO*	*$1295.00*	**$1129.00**
	PRONTO COMPLETE WITH POWER SUPPLY POWER-UP SEQUENCER		
KGPDN2818S	*with sequencer*	*$1395.00*	**$1249.00**
	Shipped motor freight collect		

OKIDATA



- *BI-DIRECTIONAL-120 CPS*
- *Parallel and Serial I/O*
- *9x9 Matrix (Alphanumeric)*
- *100 Thru 1200 Baud*
- *6x9 or 12 matrix for graphics*
- *Self Test*
- *5,8.3,10,16 Characters p/Inch*
- *Out of paper switch*
- *6 or 8 Lines per Inch*
- *Friction or Tractor Feed*
- *80 CPL@10 CPI for 82A*
- *3" to14" Top of form*
- *132 CPL@10 CPI for 83A & 84*
- *(Switch Selectable)*
- *10 Different Character Sets*

The above printers come complete with friction and tractor feed. Front panel selection of 10 different form lengths. Front or bottom paper loading for up to 4 part forms and tear bar. All three printers have a parallel interface as standard. The 82A and 83A also include a 1200 baud serial interface as standard.

Part No.	Description	List Price	SALE
KGOKIDAT82AT	80 column printer w/tractor (25 lbs.)		**$539.00**
KGOKBFRAPH82	High resolution graphics ROM 60x66		**$ 75.00**
KGOKIDAT83AT	132 column printer w/tractor (35 lbs.)		**$750.00**
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KGMBSAPLINTWC*	Apple Parallel Interface w/cable (1 lb.)		**$ 75.00**

**Sold only with printers*

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KGEPNMX80FT	with Tractor/Friction feed (20 lbs.)	**$550.00**
KGEPNMX100	132 col./80CPS (30 lbs.) Tractor/Friction Feed	**$725.00**
KGMBSAPLINTWC*	Apple parallel interface with cable	**$ 75.00**
KGMBSEI1*	Serial interface for EPSON Printers	**$ 59.00**

**Sold only with printers*

ADDS

Applied Digital Data Systems Inc.

SALE! $525.00

VIEWPOINT — ADDS

Detachable keyboard, RS232 interface and auxiliary port, 80 x 24 display, tiltable screen.

KGADDVWPR *Sh. weight: 30 lbs.* *$699.00* **$525.00**

DISK CABINETS

V-100 - VISTA

- *Desk or rack mountable*
- *Internal power and data cables*
- *Drives pull out for easy service and maintenance*

KGVISV100 *Disk Drive Cabinet (43 lbs)* *$495.00* **$449.00**

SINGLE 8" - Q.T.

Single 8" cabinet with power supply

KGQTCDDC8 *(22 lbs.)* *$249.00* **$225.00**

DUAL 8" - Q.T.

Dual 8" cabinet with power supply

KGQTCDDC88 *(24 lbs.)* *$395.00* **$349.00**

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KGVIS9801	*Single 5" with P.S.*	**$ 85.00**
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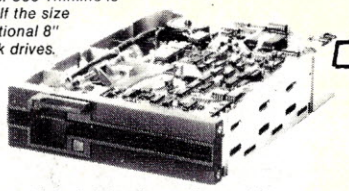
Tandon

Tandon TM-800 Thinline is exactly half the size of conventional 8" floppy disk drives.



Exactly one-half the height of any other model.
Proprietary, high-resolution, read-write heads patented by Tandon
D.C. only operation - no A.C. required
Industry standard interface.
Three millisecond track-to-track access time *(9 lbs.)*

KGTNDTM8481	*Single Sided* **$425.00**	2 or more	**$395.00**
KGTNDTM8482	*Double Sided* **$575.00**	2 or more	**$550.00**
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TANDON 5¼" DRIVES

KGTNDTM1001	*Single Sided, 250KB (5 lbs.)*	**$249.00* ea**
	2 or More $220.00	
KGTNDTM1002	*Double Sided, 500KB*	**$325.00 ea.**
	2 or More $299.00	
KGTNDTM1003	*Single Sided, 500KB*	**$325.00 ea.**
	2 or More $299.00	
KGTNDTM1004	*Double Sided, 1000KB*	**$449.00 ea.**
	2 or More $420.00	
KGTNDTM5M	*manual, not included with drive*	**$ 10.00**

**As used in the IBM P.C.*

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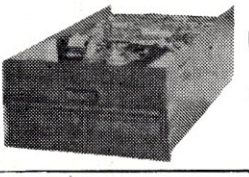

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2 or More $525.00 each

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Single sided, double density - most popular 8" drive

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KGSHUSA801RM	*Manual for 801R drives*	**$ 10.00**

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- *Accepts any combination of 8" drives (QUME/Shugart 801R type or ½ size Tandon type)*
- *Also accepts hard disks*
- *Positive pressure*
- *Optional Disk environment monitor shows supply voltage and internal cabinet temperature*
- *Internal power and data cables provided.*

UNIVERSAL DRIVE CABINET complete with power supply, fan and filter, and all internal cables for attachment of two 8" floppy drives.

KGIIIUDE004	Dual Drive Cabinet (Sh. Wt. 40 lbs)	$495.00	**$450.00**
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KGIIIUDERCK	19" Rack Mount kit UDE004		**$ 89.95**

THIN THREE DRIVE CABINET complete with power supply, and all internal cables for attachment of three thin 8" floppy drives (Tankdon type). One AC power connector is also provided for use with full size drive.

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KGIIIUDETTTEM	with Environmental Monitor installed	$584.95	**$535.00**

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5101	256 x 4	(cmos) (450ns)	4.95	3.95
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2102L-2	1024 x 1	(LP) (250ns)	1.69	1.55
2102L-4	1024 x 1	(LP) (450ns)	1.29	1.15
2111	256 x 4	(450ns)	2.99	2.49
2112	256 x 4	(450ns)	2.99	2.79
2114	1024 x 4	(450ns)	8/16.95	1.95
2114L-2	1024 x 4	(LP) (200ns)	8/19.95	2.35
2114L-3	1024 x 4	(LP) (300ns)	8/18.95	2.25
2114L-4	1024 x 4	(LP) (450ns)	8/17.95	2.10
2147	4096 x 1	(55ns)	9.95	call
TMS4044-4	4096 x 1	(450ns)	3.49	3.25
TMS4044-3	4096 x 1	(300ns)	3.99	3.75
TMS40L44-2	4096 x 1	(LP) (200ns)	4.49	4.25
MK4118	1024 x 8	(250ns)	9.95	call
TMM2016	2048 x 8	(150ns)	call	call
HM6116-4	2048 x 8	(cmos) (200ns)	call	call
HM6116-3	2048 x 8	(cmos) (150ns)	call	call
HM6116-2	2048 x 8	(cmos) (120ns)	call	call
HM6116LP-4	2048 x 8	(LP) (cmos) (200ns)	call	call
HM6116LP-3	2048 x 8	(LP) (cmos) (150ns)	call	call
HM6116LP-2	2048 x 8	(LP) (cmos) (120ns)	call	call
Z-6132	4096 x 8	(Qstat) (300ns)	34.95	call

LP = Low Power Qstat = Quasi-Static

DYNAMIC RAMS

			Each	100 pcs
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MM5298	8192 x 1	(250ns)	1.85	call
4116-120	16384 x 1	(120ns)	8/29.95	call
4116-150	16384 x 1	(150ns)	8/18.95	1.95
4116-200	16384 x 1	(200ns)	8/13.95	call
4116-250	16384 x 1	(250ns)	8/13.90	call
4116-300	16384 x 1	(300ns)	8/13.80	call
2118	16384 x 1	(5v) (150ns)	4.95	call
MK4816	2048 x 8	(5v) (300ns)	24.95	call
4164-200	65536 x 1	(5v) (200ns)	call	call
4164-150	65536 x 1	(5v) (150ns)	call	call

EPROMS

			Each	8 pcs
1702	256 x 8	(1us)	4.95	4.50
2708	1024 x 8	(450ns)	3.75	3.50
2758	1024 x 8	(5v) (450ns)	9.95	8.95
TMS2516	2048 x 8	(5v) (450ns)	6.95	5.95
2716	2048 x 8	(5v) (450ns)	4.95	3.95
2716-1	2048 x 8	(5v) (350ns)	9.00	8.50
TMS2716	2048 x 8	(450ns)	9.95	8.95
TMS2532	4096 x 8	(5v) (450ns)	9.95	7.95
2732	4096 x 8	(5v) (450ns)	9.95	7.95
2732A-2	4096 x 8	(5v) (200ns)	call	call
2764	8192 x 8	(5v) (450ns)	call	call
TMS2564	8192 x 8	(5v) (450ns)	call	call

5v = Single 5 Volt Supply

EPROM ERASERS

	Timer	Capacity Chip	Intensity (uW/CM²)	
PE-14		6	5,200	83.00
PE-14T	X	6	5,200	119.00
PE-24T	X	9	6,700	175.00
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PR-125T	X	16	15,000	349.00
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2K x 8 STATIC

TMM-2016 (200NS)

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64K DYNAMIC

4164 (200NS)

8/8.95 EA.

16K DYNAMIC

4116 (200NS)

8/13.95 EA

16K EPROMS

2716 (450NS)

8/3.95 ea.

32K EPROMS

2532 or 2732 (450NS)

8/7.95 EA.

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PROMS

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74S287	256x4 TS	14S10	82S129	6301-1	7611	3.25
74S288	32x8 TS	18S030	82S123	6331-1	7603	2.75
74S387	256x4 OC	14SA10	82S126	6300-1	7610	2.95
74S471	256x8 TS	18S22		6309-1		10.95
74S472	512x8 TS	18S42	82S147	6349-1	7649	10.95
74S473	512x8 OC	18SA42	82S146	6348	7648	10.95
74S474	512x8 TS	18S46	82S141	6341	7641	12.95
74S475	512x8 TS	18SA46	82S140	6340	7640	12.95
74S478	1Kx8 TS	28S86				19.95
74S570	512x4 OC	27S12	82S130	6305	7620	5.95
74S571	512x4 TS	27S13	82S131	6306-1	7621	5.95
74S572	1kx4 OC	24SA41	82S136	6352-1	7642	9.95
74S573	1kx4 TS	24S41	82S137	6353-1	7643	9.95
87S180	1kx8 OC	28SA86	82S180	6380-1	7680	19.25
87S181	1kx8 TS	28S86	82S181	6381-1	7681	16.25
87S184	2kx4 OC	24SA81	82S184		7684	17.20
87S185	2kx4 TS	24S81	82S185		7685	16.95
87S190	2kx4 OC	28SA166	82S190		76160	39.95
87S191	2kx8 TS	28S166	82S191		76161	39.95

74LS00 SERIES

74LS00	.25	74LS169	1.75
74LS01	.25	74LS170	1.75
74LS02	.25	74LS173	.80
74LS03	.25	74LS174	.95
74LS04	.25	74LS175	.95
74LS05	.25	74LS181	2.15
74LS08	.35	74LS189	9.95
74LS09	.35	74LS190	1.00
74LS10	.25	74LS191	1.00
74LS11	.35	74LS192	.85
74LS12	.35	74LS193	.95
74LS13	.45	74LS194	1.00
74LS14	1.00	74LS195	.95
74LS15	.35	74LS196	.85
74LS20	.25	74LS197	.85
74LS21	.35	74LS221	1.20
74LS22	.25	74LS240	1.29
74LS26	.35	74LS241	1.29
74LS27	.35	74LS242	1.85
74LS28	.35	74LS243	1.85
74LS30	.25	74LS244	1.29
74LS32	.35	74LS245	1.90
74LS33	.55	74LS247	.75
74LS37	.55	74LS248	1.25
74LS38	.35	74LS249	.99
74LS40	.35	74LS251	1.30
74LS42	.55	74LS253	.85
74LS47	.75	74LS257	.85
74LS48	.75	74LS258	.85
74LS49	.75	74LS259	2.85
74LS51	.25	74LS260	.65
74LS54	.35	74LS266	.55
74LS55	.35	74LS273	1.65
74LS63	1.25	74LS275	3.35
74LS73	.40	74LS279	.55
74LS74	.45	74LS280	1.98
74LS75	.50	74LS283	1.00
74LS76	.40	74LS290	1.25
74LS78	.50	74LS293	1.85
74LS83	.75	74LS295	1.05
74LS85	1.15	74LS298	1.20
74LS86	.40	74LS324	1.75
74LS90	.65	74LS352	1.55
74LS91	.89	74LS353	1.55
74LS92	.70	74LS363	1.35
74LS93	.65	74LS364	1.95
74LS95	.85	74LS365	.95
74LS96	.95	74LS366	.95
74LS107	.40	74LS367	.70
74LS109	.40	74LS368	.70
74LS112	.45	74LS373	1.75
74LS113	.45	74LS374	1.75
74LS114	.50	74LS377	1.45
74LS122	.45	74LS378	1.18
74LS123	.95	74LS379	1.35
74LS124	2.99	74LS385	1.90
74LS125	.95	74LS386	.65
74LS126	.85	74LS390	1.90
74LS132	.75	74LS393	1.90
74LS136	.55	74LS395	1.65
74LS137	.99	74LS399	1.70
74LS138	.75	74LS424	2.95
74LS139	.75	74LS447	.37
74LS145	1.20	74LS490	1.95
74LS147	2.49	74LS624	3.99
74LS148	1.35	74LS668	1.69
74LS151	.75	74LS669	1.89
74LS153	.75	74LS670	2.20
74LS154	2.35	74LS674	9.65
74LS155	1.15	74LS682	3.20
74LS156	.95	74LS683	2.30
74LS157	.75	74LS684	2.40
74LS158	.75	74LS685	2.40
74LS160	.90	74LS688	2.40
74LS161	.95	74LS689	2.40
74LS162	.95	74LS783	24.95
74LS163	.95	81LS95	1.69
74LS164	.95	81LS96	1.69
74LS165	.95	81LS97	1.69
74LS166	2.40	81LS98	1.69
74LS168	1.75		

TRANSISTORS

PN2222	10/1.00	100/ 8.99
2N2222	.25	50/10.99
2N2907	.25	50/10.99
2N3055	.79	10/ 6.99
2N3904	10/1.00	100/ 8.99
2N3906	10/1.00	100/ 8.99
1N4148 (1N914)		25/ 1.00
1N4004		10/ 1.00

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(408) 995-5430 • Telex 171-110

Circle 84 on Reader Service card.

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Z-80

2.5 Mhz

Z80-CPU	6.00
Z80-CTC	5.95
Z80-DART	15.25
Z80-DMA	17.50
Z80-PIO	6.00
Z80-SIO/O	18.50
Z80-SIO/1	18.50
Z80-SIO/2	18.50
Z80-SIO/9	16.95

4.0 Mhz

Z80-A-CPU	6.00
Z80-CTC	8.65
Z80A-DART	18.75
Z80A-DMA	27.50
Z80A-PIO	6.00
Z80A-SIO/O	22.50
Z80A-SIO/1, O	22.50
Z80A-SIO½2	22.50
Z80A-SIO/9	19.95

6.0 Mhz

Z80B-CPU	17.95
Z80B-CTC	15.50
Z80B-PIO	15.50

ZILOG

Z6132	34.95
Z8	39.95

8200

8202	34.95
8205	3.50
8212	1.85
8214	3.85
8216	1.80
8224	2.50
8226	1.80
8228	4.90
8237	19.95
8238	4.95
8243	4.45
8250	14.95
8251	4.75
8253	9.25
8253-5	9.85
8255	4.75
8255-5	5.25
8257	8.50
8257-5	8.95
8259	6.90
8259-5	7.50
8272	39.95
8275	29.95
8279	9.50
8279-5	10.00
8282	6.65
8283	6.65
8284	5.70
8286	6.65
8287	6.50
8288	25.00
8289	49.95

8000 SERIES

8035	7.25
8039	7.95
INS8060	17.96
INS8073	29.95
8080	3.95
8085	7.95
8085A-2	11.95
8086	59.95
8087	Call
8088	39.95
8089	89.95
8155	7.95
8156	8.95
8185	29.95
8185-2	39.95
8741	39.95
8748	29.95
8755	32.00

9000 SERIES

9316	1.00
9334	2.50
9368	3.95
9401	9.95
9601	.75
9602	1.50
96S02	1.95

DATA ACQUISITION

ADC0800	5.55
ADC0804	4.95
ADC0809	5.25
ADC0817	10.95
DAC0800	4.95
DAC0808	4.95
DAC1020	8.25
DAC1022	5.95
MC1408L8	4.95

6800

68000	call
6800	4.95
6802	10.95
6808	13.90
6809E	19.95
6809	19.95
6810	2.95
6820	4.95
6821	4.95
6828	14.95
6840	12.95
6843	34.95
6844	25.95
6845	16.95
6847	12.25
6850	3.45
6852	5.75
6860	10.95
6862	11.95
6875	6.95
6880	2.95
6883	24.95
68047	24.95
68488	19.95
68B00	10.95
68B02	22.25
68B09E	29.95
68B09	29.95
68B10	7.95
68B21	12.95
68B45	35.95
68B50	12.95

6800 = 1 MHZ

68B00 = 2 MHZ

6500 SERIES

1 MHZ

6502	6.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	8.75
6532	11.25
6545	22.50
6551	11.85

2 MHZ

6502A	9.95
6522A	11.70
6532A	12.40
6545A	28.50
6551A	12.95

3 MHZ

6502B	14.95

CRYSTALS

32.768 khz	3.95
1.0 mhz	4.95
1.8432	4.95
2.0	3.95
2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579535	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
5.9904	3.95
6.0	3.95
6.144	3.95
6.5536	3.95
8.0	3.95
10.0	3.95
14.31818	3.95
15.0	3.95
16.0	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95
32.0	3.95

DISC CONTROLLERS

1171	24.95
1791	36.95
1793	44.95
1795	54.95
1797	54.95
6843	42.95
8272	39.95
UPD765	39.95
1691	18.95
2143	18.95

INTERFACE

8T26	1.69
8T28	2.49
8T95	.99
8T96	.99
8T97	.99
8T98	.99
DM8131	2.95
DP8304	2.29

MISC

3341	4.95
76477	3.95
AY3-8910	12.95
MC3340	1.49
95H90	7.99
11C90	13.95
8202A	34.95
3242	7.95
MC3480	9.00
MC4024	3.95
MC4044	4.50
3205	3.50

BIT-RATE GENERATORS

14411	9.95
BR1941	9.95
4702	12.95
COM5016	16.95
MM5307	10.95

UARTS

AY3-1014	6.95
AY5-1013	3.95
PT1472	9.95
TR1602	3.95
2350	9.95
TMS6011	5.95
IM6402	7.95
IM6403	8.95
INS8250	14.95

KEYBOARD CHIPS

AY5-2376	11.95
AY5-3600	11.95
74C922	5.25
74C923	5.50

IC SOCKETS

	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39

ST = SOLDERTAIL

14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80

WW = WIREWRAP

CONNECTORS

RS232 MALE	3.25
RS232 FEMALE	3.75
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

DIP SWITCHES

4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

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(CALIFORNIA RESIDENTS)

INTERSIL

ICL7103	9.50
ICL7106	9.95
ICL7107	12.95
ICL8038	3.95
ICM7107A	5.59
ICM7208	15.95

LINEAR

LM301	.34	LM350K	5.60	NE570	4.75	LM1800	2.99	TL071	.79
LM301H	.79	LM350T	4.60	NE571	3.95	LM1812	8.25	TL072	1.19
LM307	.45	LM358	.98	NE592	2.75	LM1815	5.20	TL074	2.19
LM308	.98	LM359	1.79	LM703	.89	LM1818	2.90	TL081	.79
LM308H	1.15	LM376	3.75	LM709	.59	LM1820	3.50	TL082	1.19
LM309H	1.95	LM377	2.29	LM710	.75	LM1830	3.50	TL083	1.19
LM309K	1.49	Lm378	2.50	LM711	.79	LM1871	5.49	TL084	2.19
LM310	1.75	LM379	4.50	LM723	.49	LM1872	5.49	LF347	2.19
LM311	.64	LM380	1.29	LM723H	.55	LM1877	3.25	LF351	.60
LM311H	.89	LM380N-8	1.10	LM733	.98	LM1889	2.49	LF353	1.00
LM312H	1.75	LM381	1.60	LM741N-8	.35	LM1896	1.75	LF355	1.10
LM317K	3.95	LM382	1.60	LM741N-14	.35	LM2877	2.05	LF356	1.10
LM317	1.95	LM383	1.95	LM741H	.40	LM2878	2.25	LF357	1.40
LM318	1.49	LM384	1.95	LM747	.79	LM2900	.85		
LM318H	1.59	LM386	1.50	LM748	.59	LM2901	1.00		
LM319H	1.25	LM387	1.40	LM1014	2.75	LM3900	.59		
LM319	1.25	LM389	1.35	LM1303	1.95	LM3905	1.25		
LM320 (see 7900)		LM390	1.95	LM1304	1.19	LM3909	.98		
LM322	1.65	LM392	.69	LM1305	1.49	LM3911	2.25		
LM323K	4.95	LM394H	3.60	LM1307	.85	LM3914	3.95		
LM324	.59	LM399H	5.00	LM1310	2.90	LM3915	3.95		
LM329	.69	NE531	3.75	MC1330	1.89	LM3916	3.95		
LM331	3.95	NE536	6.00	MC1349	1.89	MC4024	3.95		
LM334	1.30	NE555	.39	MC1350	1.29	MC4044	4.50		
LM335	1.40	NE556	.69	MC1358	1.79	RC4136	1.25		
LM336	1.75	NE558	1.50	LM1414	1.59	RC4151	3.95		
LM337K	3.95	NE561	19.95	LM1458	.69	LM4250	1.75		
LM337T	2.95	NE562	6.00	LM1488	.99	LM4500	3.25		
LM338K	6.95	NE564	3.95	LM1489	.99	LM13080	1.29		
LM339	.99	LM565	.99	LM1496	.85	LM13600	1.49		
LM340 (see 7800)		LM566	1.49	LM1558H	3.10	LM13700	1.49		
LM348	1.20	LM567	1.29						

BI FET

TI

EXAR

XR 2206	3.75
XR 2207	3.85
XR 2208	3.90
XR 2211	5.25
XR 2240	3.25

RCA

CA 3010	.99
CA 3013	2.00
CA 3023	2.75
CA 3035	2.49
CA 3039	1.29
CA 3046	1.25
CA 3053	1.45
CA 3059	2.90
CA 3060	2.90
CA 3065	1.75
CA 3080	1.10
CA 3081	1.65
CA 3082	1.65
CA 3083	1.55
CA 3086	.80
CA 3089	2.99
CA 3906	3.49
CA 3130	1.30
CA 3140	1.15
CA 3146	1.85
CA 3160	1.19
CA 3401	.59
CA 3600	3.45

CLOCK CIRCUITS

MM5314	4.95
MM5369	3.95
MM5375	4.96
MM58167	8.95
MM58174	11.95
MSM5832	8.95

FUNCTION GENERATORS

MC4024	Dual VCO	3.95
LM566	Function Generator	1.49
XR2206	Function Generator	3.75
8038	Waveform Generator	3.95

VOLTAGE REG's

7805T	.79	7905T	.89
7808T	.99	7912T	.89
7812T	.79	7915T	1.19
7815T	.99	7924T	1.19
7824T	.99		
		7905K	1.49
7805K	1.39	7912K	1.49
7812K	1.39	79LO5	.79
7815K	1.39	79L12	.79
78LO5	.69	79L15	.79
78L12	.69		
78L15	.69		
		LM317K	3.95
LM309K	1.49	LM323K	4.95
LM317T	1.95	LM337K	3.95

T = TO-220 K= TO-3 L = TO-92

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7400 SERIES

7400	.19	74136	.50
7401	.19	74141	.65
7402	.19	74142	2.95
7403	.19	74143	2.95
7404	.19	74145	.60
7405	.25	74147	1.75
7406	.29	74148	1.20
7407	.29	74150	1.35
7408	.24	74151	.65
7409	.19	74152	.65
7410	.19	74153	.55
7411	.25	74154	1.40
7412	.30	74155	.75
7413	.35	74156	.65
7414	.55	74157	.55
7416	.25	74159	1.65
7417	.25	74160	.85
7420	.19	74161	.70
7421	.35	74162	.85
7422	.29	74163	.85
7423	.29	74164	.85
7425	.29	74165	.85
7426	.29	74166	1.00
7427	.29	74167	2.95
7428	.45	74170	1.65
7430	.19	74172	5.95
7432	.29	74173	.75
7433	.45	74174	.89
7437	.29	74175	.89
7438	.29	74176	.89
7440	.19	74177	.75
7442	.49	74178	1.15
7443	.65	74179	1.75
7444	.69	74180	.75
7445	.69	74181	2.25
7446	.59	74182	.75
7447	.69	74184	2.00
7448	.69	74185	2.00
7450	.19	74186	18.50
7451	.23	74190	1.15
7453	.23	74191	1.15
7454	.23	74192	.79
7460	.23	74193	.79
7470	.35	74194	.85
7472	.29	74195	.85
7473	.34	74196	.79
7474	.35	74197	.75
7475	.49	74198	1.35
7476	.35	74199	1.35
7480	.59	74221	1.35
7481	1.10	74246	1.35
7482	.95	74247	1.25
7483	.50	74248	1.85
7485	.65	74249	1.95
7486	.35	74251	.75
7489	4.95	74259	2.25
7490	.35	74265	1.35
7491	.40	74273	1.95
7492	.50	74276	1.25
7493	.49	74279	.75
7494	.65	74283	2.00
7495	.55	74284	3.75
7496	.70	74285	3.75
7497	2.75	74290	.95
74100	1.00	74293	.75
74107	.30	74298	.85
74109	.45	74351	2.25
74110	.45	74365	.65
74111	.55	74366	.65
74116	1.55	74367	.65
74120	1.20	74368	.65
74121	.29	74376	2.20
74122	.45	74390	1.75
74123	.55	74393	1.35
74125	.45	74425	3.15
74126	.45	74426	.85
74128	.55	74490	2.55
74132	.45		

CMOS

74C00	.35	4019	.45
74C02	.35	4020	.95
74C04	.35	4021	.95
74C08	.35	4022	1.15
74C10	.35	4023	.35
74C14	1.50	4024	.75
74C20	.35	4025	.35
74C30	.35	4026	1.65
74C32	.50	4027	.65
74C42	1.75	4028	.80
74C48	1.20	4029	.95
74C73	.65	4030	.45
74C74	.85	4034	2.95
74C76	.80	4035	.85
74C83	1.95	4040	.95
74C85	1.95	4041	1.25
74C86	.95	4042	.75
74C89	4.50	4043	.85
74C90	1.75	4044	.85
74C93	1.75	4046	.95
74C95	1.75	4047	.95
74C107	1.00	4049	.55
74C150	5.75	4050	.55
74C151	2.25	4051	.95
74C154	3.25	4053	.95
74C157	1.75	4060	1.45
74C160	2.00	4066	.75
74C161	2.00	4068	.40
74C162	2.00	4069	.35
74C163	2.00	4070	.35
74C164	2.00	4071	.30
74C165	2.00	4072	.30
74C173	2.00	4073	.30
74C174	2.25	4075	.30
74C175	2.25	4076	.95
74C192	2.25	4078	.30
74C193	2.25	4081	.30
74C195	2.25	4082	.30
74C200	5.75	4085	.95
74C221	2.25	4086	.95
74C373	2.75	4093	.95
74C374	2.75	4098	2.49
74C901	.80	4099	1.95
74C902	.85	14409	12.95
74C903	.85	14410	12.95
74C905	10.95	14411	11.95
74C906	.95	14412	12.95
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74C908	2.00	4502	.95
74C909	2.75	4503	.65
74C910	9.95	4508	1.95
74C911	10.00	4510	.95
74C912	10.00	4511	.95
74C914	1.95	4512	.95
74C915	2.00	4514	1.25
74C918	2.75	4515	2.25
74C920	17.95	4516	1.55
74C921	15.95	4518	1.25
74C922	5.59	4519	1.25
74C923	5.95	4520	1.25
74C925	6.75	4522	1.25
74C926	7.95	4526	1.25
74C927	7.95	4527	1.95
74C928	7.95	4528	1.25
74C929	19.95	4531	.95
74C930	19.95	4532	1.95
4000	.35	4538	1.95
4001	.35	4539	1.95
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4006	.95	4555	.95
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4014	.95	80C07	.95
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4018	.95	80C98	1.20

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74S38	1.68	74S251	1.90	74S240	3.98	74S571	7.80
74S40	.44	74S253	7.45	74S257	1.39		
74S51	.78	74S157	1.19	74S258	1.49		
74S64	.79	74S158	1.45	74S260	1.83		
74S65	1.25	74S161	2.85	74S274	19.95		
74S74	.69	74S162	3.70	74S275	19.95		

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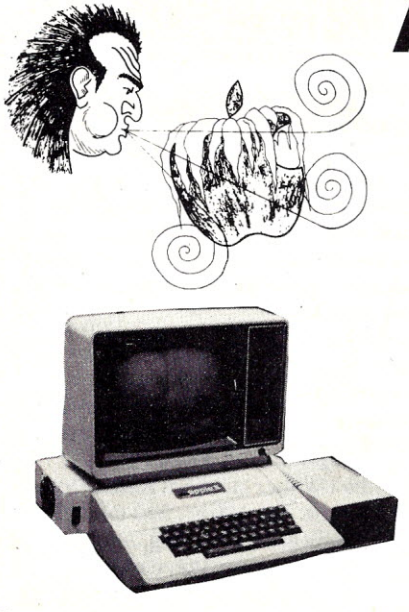

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CALENDAR

Basic Training Camp

Lake Forest College will sponsor a series of one-week computer camp sessions from June 20–Aug. 6. The sessions are open to all youngsters 12 to 18 years old and will focus on the Basic language.

For more information contact Dr. Lowell Carmony, Associate Professor of Mathematics and Computer Studies, Lake Forest College, Lake Forest, IL 60045. 312-234-3100.

National Computer Camp

National Computer Camp will be held in Simsbury, CT, from July 11–Aug. 16 for youngsters ages ten to 18. In addition to learning about computers, children will have an opportunity to enjoy recreational activities including swimming and tennis.

For more information contact Michael Zabinski, Ph.D., National Computer Camp, PO Box 624, Orange, CT 06477. 203-795-3049.

Peripherals '82

The first International Peripheral Equipment and Software Exposition (Peripherals '82) will be held Sept. 29, 30 and Oct. 1 at the Anaheim Convention Center, Anaheim, CA.

For more information on exhibiting or visiting Peripherals '82 contact Cahners Exposition Group, 222 West Adams St., Chicago, IL 60606. 312-263-4866, Telex: 256148.

Origins '82

Origins '82, the eighth annual national Adventure Gaming show, will be held July 23–25 at the University of Maryland, Baltimore, MD. This gaming convention will include exhibitions, tournaments, seminars and demonstrations.

For more information contact Origins '82, PO Box 15405, Baltimore, MD 21220. 301-539-4634.

PerCompAsia 82

The first Southeast Asian personal computer hardware and software show will be held October 20–23 at the Hyatt Convention Center in Singapore.

For further information contact Overseas Exhibition Services Ltd., 11 Manchester Square, London, W1M 5AB, England. Telephone: 01-486 1951, Telex: 24591 Montex.

The Fifth Annual Personal Computer World Show

The fifth annual Personal Computer World Show will be held at Barbican Centre, London, England, Sept. 9–12 and will include a wide range of exhibits oriented toward the business, scientific, educational and hobbyist markets.

For more information contact Tim Collins, Montbuild Ltd., 11 Manchester Square, London W1M 5AB. Telephone: 01-486 1951, Telex: 24591, Montex G.

Computer Camp, Inc.

Computer Camp, Inc. will hold five two-week sessions this summer at each of their three campsites—Santa Barbara, CA, Cape Cod, MA, and Lake Tahoe, CA. Campers will have an opportunity to learn Basic, the principles of electronics, advanced languages (Pascal, Fortran, assembly language and Lisp), artificial intelligence and robotics. In addition, recreational activities such as swimming, tennis, soccer, hiking and sailing will be offered. Youngsters ages 7–16 may attend. Each two-week session is $795.

Computer Camp, Inc. also offers week-long seminars for adults at the Club Med resort in Ixtapa, Mexico and at the El Encanto Hotel, Santa Barbara, CA. These seminars focus on general microcomputer applications.

For further information contact Computer Camp, Inc., 1235 Coast Village Rd., Suite G, Santa Barbara, CA 93108. 805-969-7871 or 800-235-6965.

Logo Courses

Logo, The Computer Learning Center, is offering courses and a computer day camp this summer. The camp and the courses are one week long and are offered ten times throughout the summer.

For more information contact Logo, The Computer Learning Center, 989 Avenue of the Americas, New York, NY 10018. 212-564-6020.

ACM-IEEE Fifteenth Annual Workshop on Microprogramming

The fifteenth annual workshop on microprogramming (MICRO-15) jointly sponsored by ACM, SIGMICRO and IEEE TC-MICRO will be held October 5–7, in Palo Alto, CA.

A tutorial covering current issues in firmware engineering will be presented on the preceding day, October 4, by Dr. Ted Lewis.

For more information contact Dr. Joseph Fisher, MICRO-15 Program Chairman, Yale University, Box 2158, Yale Station, New Haven, CT 06520.

Second International Computer Engineering Conference and Show

The Computer Engineering Division of the American Society of Mechanical Engineers (ASME) will hold the second International Computer Engineering Conference and Show at the Sheraton Harbor Island Hotel, San Diego, CA, August 15–19. Sixty panel and paper sessions covering the full spectrum of computer topics of interest to engineers are planned along with telecommunication events, poster sessions and student activities. A computer show will be conducted in conjunction with this conference in the exhibit hall adjacent to the conference area. A few of the technical sessions are: computer-aided design, finite element techniques, computers in automotive industry, interactive graphics, computer-aided manufacturing, computers in education and computers in energy systems.

For further information contact Walter Mockert, ASME Headquarters, 345 E. 47th St., New York, NY 10017, 212-644-8032 or Dan Goetschel, Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics, Rensselaer Polytechnic Institute, Troy, NY 12181, 518-270-6471.

Microcomputer Applications in Education—Univ. of Nevada

Microcomputer Applications in Education for teachers and administrators is a continuing education workshop sponsored by the University of Nevada-Reno Division of Continuing Education and the Washoe County School District. It will be held at Cloud's Cal-Neva, August 1–4.

For further information contact Shirley Beck, Division of Continuing Education, Reno, NV 89557. 702-784-4801.

The Computer: Extension of the Human Mind

The College of Education, University of Oregon, Eugene, OR, will hold its third annual summer conference, "The Computer: Extension of the Human Mind," July 21–23 at the Eugene Hilton Hotel and conference center. National leaders in the field of computer science and in computer manufacturing will explore the current state of computers in education and provide a glimpse of future trends. A variety of computers will be displayed and operated and group discussion sessions will be held.

Registration and program details may be obtained by writing '82 Summer Conference, Jude Ridge, College of Education, University of Oregon, Eugene, OR 97402. 503-686-3405.

Welch Academy Computer Camp

Computer camp will be held at J. Hamilton Welch Academy, Ft. Myers, FL, June 14 to Aug. 13 for children ages 8 to 14. Out of town students will live with selected families of local students. The camp's emphasis will be on computers but recreation such as swimming, movies and music instructions will also be available. Cost is $125 per week or $500 per month and includes tuition, room, board and all learning materials. The camp is fully accredited by the Southern Association of Colleges and Schools.

Write for details to Registrar, J. Hamilton Welch Academy, 3049 McGregor Blvd., Fort Myers, FL 33901. 813-334-6044.

New York Apple Fair

The Big Apple Users Group of New York will hold its third annual Apple Fair on Aug. 21 at the New York University campus (40 West Fourth St., NYU, Tisch Hall) from 10 AM to 5 PM. The theme of the fair will stress both business and leisure applications of Apple hardware and software. The event is free.

The program will include general business application classes and lectures on software (VisiCalc, plus various data management and word processing systems) as well as lectures and hands-on activities in the realm of graphics, games and education.

For more information contact Big Apple Users Group, PO Box 490, Bowling Green Station, New York, NY 10274. 914-636-3417.

Fall Conference on Classroom Applications of Computers

Computer-Using Educators will hold the third annual Fall Conference on Classroom Applications of Computers in San Jose, CA, on October 1 and 2.

The schedule includes exhibits as well as workshops and six hour-long sessions covering computer-related classroom activities. Curriculum topics will include all levels of education from preschool through post-secondary.

For more information concerning membership in Computer-Using Educators or the conference write to Don McKell, Conference Coordinator, Computer-Using Educators, PO Box 18547, San Jose, CA 95158.

EdCom '82

The National Computer Conference and Expo for Educators will be held October 21–24 at the L.A. Convention Center, Los Angeles, CA.

EdCom '82 will feature over 200 seminars, workshops, demonstrations, exhibits, and hundreds of computers for in-depth tutorials and hands-on sessions.

Presentation topics designed for educators at all levels of expertise will include computer-aided instruction, administrative uses, classroom management, programming, research applications, authoring languages and literacy. All of these sessions will be conducted by nationally recognized professionals in the field of computer education.

For more information contact Jayne LaFountain, EdCom '82, 2629 N. Scottsdale Road, Scottsdale, AZ 85257.

IEEE COMPCON Fall '82

COMPCON Fall '82, sponsored by the IEEE, will be held Sept. 20–24 at the Capital Hilton Hotel in Washington, D.C. The topic of this conference will be Computer Networks. COMPCON Fall '82 will provide the forum for the researcher, vendor, user or legislator to explore and exchange ideas on the underlying technologies, applications and public policy issues for the 80s.

For further information contact COMPCON Fall '82, PO Box 639, Silver Spring, MD 20901. 301-589-3386.

Annual Word Processing/Information Systems Expo

The Annual Word Processing/Information Systems Expo (WP/IS) will be held September 21, 22 at the Sheraton-Washington Hotel in Washington, D.C.

For more information please contact either Mary Beth Gouled or Joseph P. Rubel, National Trade Productions, Inc., 9418 Annapolis Road, Lanham, MD 20706. 301-459-8383.

PC + 1—An IBM Personal Computer Convention

PC + 1, the annual convention and exhibition sponsored by Personna, the National Association for users of the IBM PC, will be held Sept. 8–11 at the Golden Nugget Hotel-Casino, Atlantic City, NJ. The convention will feature exhibits of products, programs and games for the IBM Personal Computer user.

For exhibition information contact Atlantic Data Supply Corp., Highway 88, Brick, NJ 08723, 201-840-8778; for Personna membership information contact Personna Computer Association, PO Box 759, Point Pleasant, NJ 08742.

Exhibits are open to the public and cost $12 if registered or $15 at the gate.

Microcomputers in Vocational Education Conference

The Microcomputers in Vocational Education Conference will be held August 12–13 at the Sheraton Inn, Madison, WI.

For more information contact Judy Rodenstein or Roger Lambert, 964 Educational Sciences Building, 1025 West Johnson St., Madison, WI 53706. 608-263-4367 or 263-2704.

MICRO QUIZ

(from page 12)

Answer: 13

This program computes the greatest common factor of two positive integers, using Euclid's Algorithm. Successive values of R are 273, 65 and 13.

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Aurora, IL

Microcomputer systems for home or business; peripherals, software, books and magazines. Apple, Hewlett-Packard Series 80 Systems, HP calculators, IDS, Qume, Starwriter printers. **Farnsworth Computer Center, 1891 N. Farnsworth Ave., Aurora, IL 60505. 851-3888.**

Pasadena, MD

Altos, Apple, Osborne, Atari—systems, software, service. Not just another computer store! We're a full-service problem solving center for small businesses. **Computer Crossroads, Inc., 9143G Red Branch Rd., Columbia, MD; 8220 Ritchie Hwy., Pasadena, MD. 730-5513/647-7111.**

Lodi, NJ

Computer hardware: North Star, Zenith, Atari, CBM/PET, Qume, Epson and others. Software: EduWare, Professional Software, Zenith, North Star, Programma, Personal Software and others. Factory trained service dept. Books, magazines, etc. Full product line on display. **Comtek Electronics, Inc., Rt. 46 West, Lodi, NJ. 472-2440.**

Nashua, NH

Try before you buy! Unlimited demo time on all software for Apple, Atari and IBM. Come see all the latest releases here first. No sales tax! **All Software, DJ Square, Rte. 101A, Merrimack, NH 03054. 883-7000.**

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Computer hardware: North Star, Zenith, Atari, CBM-PET, Qume, Epson and others. Software: EduWare, Professional Software, Zenith, North Star, Programma, Personal Software and others. Factory trained service department. Books, magazines, etc. Full product line on display. **Comtek Electronics Inc., Staten Island Mall, Staten Island, NY. 698-7050; Coney Island Ave. and Ave. X, Brooklyn, NY. 332-5933.**

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Try computer classifieds. Buy, sell, trade, employment, etc. No charge to read ads. 300 baud, 24 hours, 512-346-4495. **Oracle Systems, 8348 Summerwood, Austin, TX 78759.**

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Computer/word-processing systems for business, school, home. Software, disk drives, printers. Books, magazines, supplies. Authorized CBM/PET dealer, service. Consulting, training, maintenance contracts. MWF noon-8 PM, Saturday 9 AM-3 PM. **Virginia Micro Systems, Inc., 14415 Jefferson Davis Highway, Woodbridge, VA 22191. 491-6502. Washington Metro 643-1063.**

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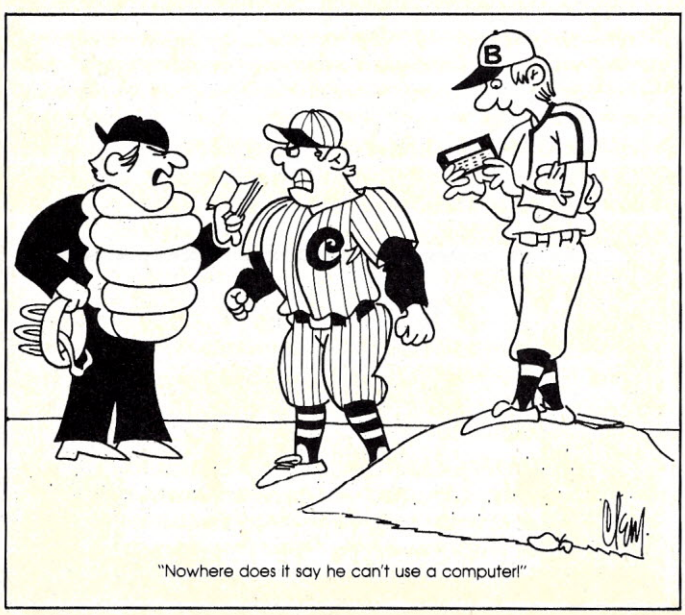

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Historical stock market data on Apple II+ DOS 3.3 diskettes. *Daily* 1970 to present: (1) DJI (2) NYSE composite (3) S&P 500—all closes. NYSE (4) volume (5) adv, decl, unchanged (6) new high-lows. *Weekly* 1962 to present: (7) DJI close and NYSE adv, decl, unchanged. $25 per file (specify 1-7). All files $150. Satisfaction guaranteed. James Robins, 1115 Highland Oaks, Arcadia, CA 91006.

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Circle 244 on Reader Service card.

IBM Support On the Rise

Word Processors, Business Software, Expansion Options

Word Processing

A raft of word processing programs for the IBM PC have appeared. The popular WordStar system, from Professional Micro Systems, Inc., Suite 3000, 4000 MacArthur Blvd., Newport Beach, CA 92660, now runs under IBM's PC-DOS. The same company provides a 20M hard disk to make word and data processing more convenient on the PC. Reader Service number 446.

Mark of the Unicorn, PO Box 423, Arlington, MA 02174, has released its FinalWord system; this sophisicated word processor costs $300. Reader Service number 447.

PowerText for the IBM provides a format file of various document setups; you need only specify that you're sending a memo, letter, etc., and the word processor will automatically format text. This one is sold by Beaman Porter, Inc., Pleasant Ridge Road, Harrison, NY 10528, for $400. Reader Service number 449.

More Software

Other business-related software for the PC includes an advanced inventory control system from Micro Architect, Inc., 96 Dothan St., Arlington, MA 02174. INV-X requires a dual disk system and a 132-column printer; it's priced at $298. Reader Service number 450.

SuperCalc, the popular spreadsheet simulator from the Sorcim Corp., 405 Aldo Ave., Santa Clara, CA 95050, makes use of the color capability of the IBM PC. Negative values and diagnostic messages are displayed in red, protected formulas in yellow. Price for SuperCalc is $295. Reader Service number 451.

Basic Business Software, Inc., PO Box 26311, Las Vegas, NV 89126, has released its IBM Basic Utilities package for the Basic programmer. A number of useful subroutines are included, and the package costs $75. Reader Service number 452.

Transplot is available from ES/Omicron, Suite 590, Building 57, Executive Park South, NE, Atlanta, GA 30329. Transplot provides bit image graphics transfer from IBM screen graphics to an Epson dot matrix printer. Price is $39. Reader Service number 453.

The PBL Corp., PO Box 599, Wayzata, MN 55391, has announced that The Personal Investor now runs on the IBM PC. This investment software communicates with the Dow Jones News/Retrieval Service, and records stock purchases, dividends and sales of stocks. It costs $145. Reader Service number 454.

Insight 1000 Plus is an interactive video authoring program, an easy tool for developing and tailoring lessons that incorporate videotape and videodisc players. The program is available from Whitney Educational Services, 1499 Bayshore Highway, Suite 107, Burlingame, CA 94010. Reader Service number 455.

Add-Ons

Hardware enhancements for the IBM PC also abound this month. Curtis Manufacturing, Winchester, NH 03470, has introduced the PC Pedestal. It can be tilted or swivelled for optimal user comfort, and serves as an attractive stand to increase airflow around the computer. It's priced at $79.95; an optional three-foot extension cable is $49.95. Reader Service number 456.

A plug-compatible letter-quality printer has been announced by NEC Information Systems, Inc., 5 Militia Drive, Lexington, MA 02173. The Spinwriter Model 3550 offers unmatched versatility, according to the manufacturer. Reader Service number 457.

Communications controllers with either one or two RS-232 ports are available from Datamac Computer Systems, 680 Almanor Ave., Sunnyvale, CA 94086. They allow IBM PC users to connect their systems to selected IBM computers, lab instruments and peripherals. Price is $139 for the one-line version, $199 for the two-line controller. Reader Service number 458.

Four new expansion options are offered by Tecmar, Inc., 23600 Mercantile Road, Cleveland, OH 44122. Tecmar's Winchester disk adds 10M of fast fixed-media memory. A 32K-byte memory card provides battery backup for static memory. Speed Disk is a unique option that simulates a floppy disk using PC-Mate Dynamic RAM. The Base Board uses four Intel 8255 parallel interface chips to provide 96 digital in/digital out lines. Reader Service number 459.

A dual asynchronous serial card adds several new capabilities to the IBM PC, including dumb terminal emulation, serial printer interface and printing with expanded tabs. Available from Davong Systems, Inc., 1061 Terra Bella Ave., Mountain View, CA 94043, the card includes two I/O channels, switch-selectable serial port addressing and four software programs which the user can copy onto the system disk. Price is $199. Reader Service number 460.

Expanded disk drive storage, including double-sided drives, is available from Interface, Inc., 20932 Cantara St., Canoga Park, CA 91304. The price for an internal single-sided drive is $470; for an internal double-sided drive, $570; single-sided external drive costs $570; and double-sided external drive is $670. Reader Service number 461.

DG Electronic Developments Co., 700 South Armstrong, Denison, TX 75020, introduced their low-cost expandable Magic RAM that expands the PC in 64K-byte increments. Each 64K block is addressable to any 64K boundary within the available 1M memory space. Prices range from $399 to $939. Reader Service number 462.

An IBM expansion board that can handle up to 1M uses only one slot on the computer—leaving four slots free for other peripherals. The TR1M board from Legend Industries, 2220 Scott Lake Road, Pontiac, MI 48054, lets you upgrade your IBM as larger RAMs become available. Reader Service number 463.

***

We at Microcomputing *strive to keep our readers informed about new products for the IBM PC. The material in this column comes from releases provided by manufacturers; due to the large number of releases we receive each month, we can't personally evaluate each product.*

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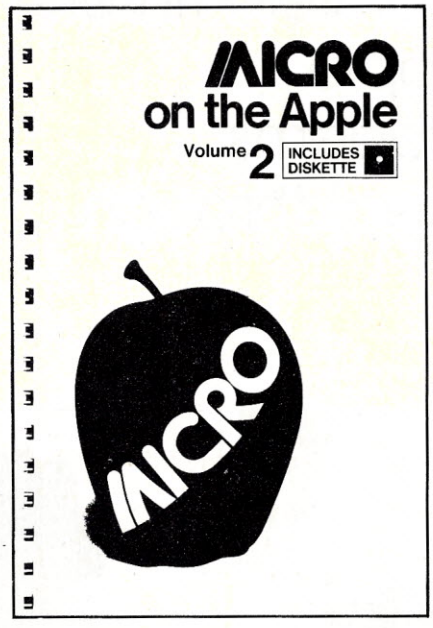

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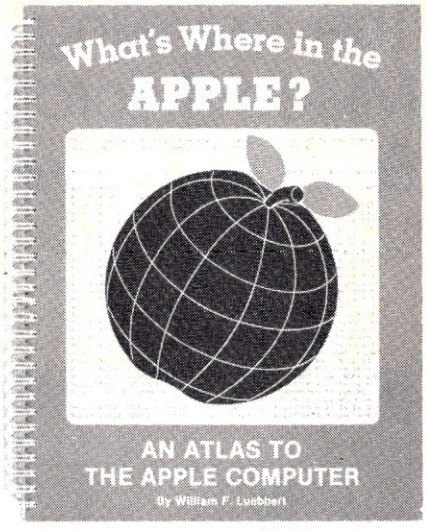

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NEW PRODUCTS

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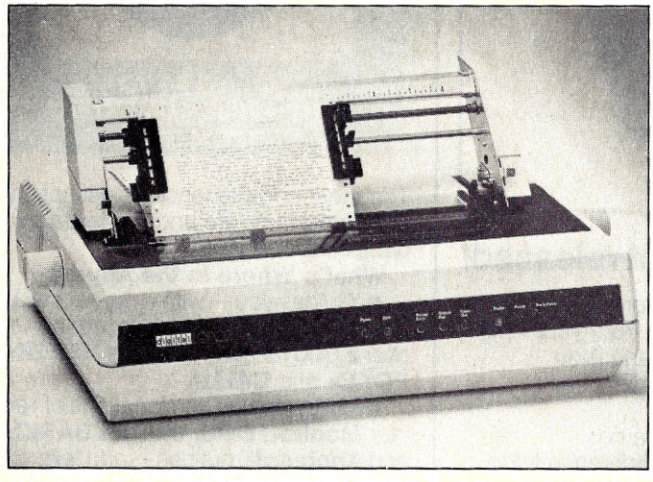
The Traveling Apple
Micom Micro Modems
Sinclair's Price Breakthrough



The LQP02 letter-quality printer from Digital Equipment Corp.

DEC Printer

The LQP02 letter-quality printer features daisywheel technology, bidirectional printing and audible paper-out warning. It also features shadow bolding—a double-strike with offset function which increases clarity and visibility of characters. The printer has an optional forms tractor and a form-feed switch to automatically advance a page. The LQP02 prints 132 columns at a pitch of 10 cpi, with print speed of 32 cps. The price is $2600 in DECmate Word Processor packaged systems.

Digital Equipment Corp., Maynard, MA 01754. Reader Service number 471.

Letter Quality

A lightweight daisywheel printer/typewriter is now available for use with popular microcomputers. The Bytewriter is a modified Olivetti Praxis 30 electronic typewriter with built-in Centronics interface; it can also be used as a standard typewriter. It has 44 alphanumeric keys plus 12 function keys, a 12-character buffer and switch-selectable character density. When used as a printer, the Bytewriter types up to 12 characters per second. A self-test program is built in. Price is $795.

Bytewriter, 125 Northview Road, Ithaca, NY 14850. Reader Service number 468.

The Bytewriter printer/typewriter with built-in interface.

Apple Crate

ABCOM Corp., 16005 Sherman Way, Suite 105, Van Nuys, CA 91409, offers a lightweight, waterproof Cordura case for your Apple computer. The Apple Crate's foam lining provides shock and vibration protection. This compact case fits under airline seats and comes with an adapter to let you connect the computer to your hotel TV. The Apple Crate with an accessory pocket and case for two disk drives costs $92. Reader Service number 469.

Three High-Speed Modems

Micom's Model 4024 is a Bell 201 and CCITT V.26 compatible 2400 bps modem for use on four-wire point-to-point or multipoint lines. Available in synchronous and

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- ★ OS-9 Debugger
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- ★ 2MHz 6809 CPU
- ★ 19 MB 5¼" Winchester DMA Subsystem
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- ★ 1 MB 5¼" Floppy Disk Drive
- ★ DMA Double Density Floppy Disk Controller

SOFTWARE FEATURES:

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- ★ OS-9 Text Editor
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- ★ OS-9 Assembler

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- ★ DMA Double Density Floppy Disk Controller
- ★ 128KB Static Ram
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SOFTWARE FEATURES: Your choice of either UniFLEX or OS-9 LEVEL TWO. Both are Unix-like Multi-User/Multi-Tasking Operating Systems.

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SOFTWARE FEATURES:

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WINCHESTER SUBSYSTEMS

Winchester packages are available for upgrading current **GIMIX** 6809 systems equipped with DMA controllers, at least one floppy disk drive, and running FLEX, OS-9 LEVEL ONE or OS-9 LEVEL TWO. The packages include one or two 19MB (unformatted) Winchester drives, DMA Hard Disk Interface, and the appropriate software drivers. The Interface can handle two 5¼" Winchester Drives, providing Automatic Data Error Detection and Correction: up to 22 bit burst error detection and 11 bit burst error correction.

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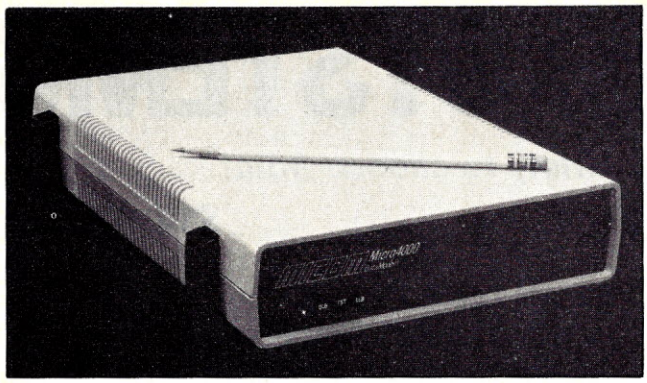


The Micro4000 modem series is now available from Micom Systems.

asynchronous versions, the new modem also supports fallback operation at 1200 bps. Typical price is $795.

The Model 4048/V27 can transmit over lines which previously would have been considered impossible for high-speed use. This versatile modem features fallback operation at 2400 bps. Priced, typically, at $1750.

The Model 4096 is small, fast and intended for point-to-point, full-duplex, four-wire operation. This 9600 bps, CCITT V.29 compatible modem typically sells for $2695.

These Micro4000 modems for worldwide communications are offered by Micom Systems, Inc., 20151 Nordhoff St., Chatsworth, CA 91311. Reader Service number 473.

Smart Drum Plotter

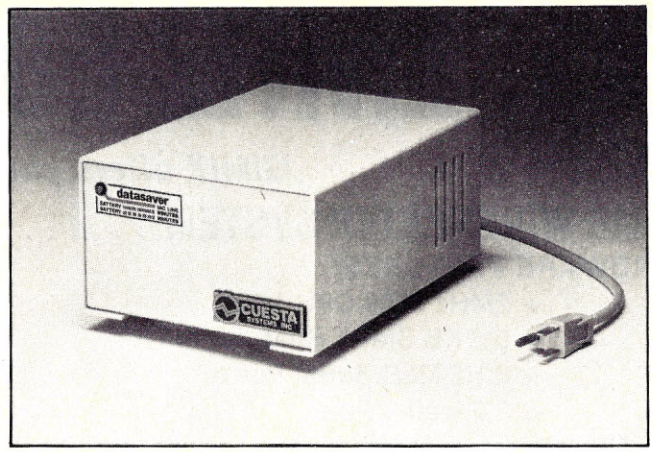
The Professional Drum Plotter, Model 80Z, incorporates a Z-80 microprocessor programmed to implement ten input commands for designing graphics. A complete ASCII character set is stored in ROM. This drum plotter is available with Centronics, RS-232 or IEEE 488 interface, for use with any microcomputer. The plotter uses standard, sprocket-feed computer or plotting paper in roll or z-fold form, and has a universal pen holder. Price is $1284.

X and Y Enterprises, PO Box 796, Huntsville, AL 35804. Reader Service number 467.

Battery Backup

The Datasaver is a battery-powered ac backup unit which keeps computer and instrument systems operating during ac power interruptions or transients. It consists of a rechargeable sealed battery, automatic battery charger, solid-state power inverter, ac line voltage monitor and cut-out switch, front-panel power status indicator and an alarm buzzer to warn the user of the loss of ac power. The 90 W unit can back up the popular microcomputers; the 200 W unit extends protection to larger micros and to network applications. Prices range from $400 to $730.

Cuesta Systems, Inc., 3440 Roberto Court, San Luis Obispo, CA 93401. Reader Service number 465.



The Datasaver from Cuesta Systems, Inc.

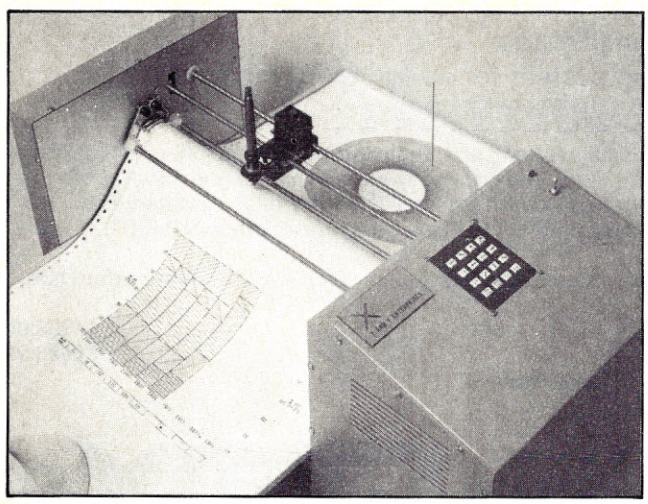
Lowest Price Yet

The Timex Computer Corp., with headquarters in Middlebury, CT, has announced the first computer priced under $100. The Timex Sinclair 1000 is compact, lightweight, fully-assembled, and priced at $99.95. Timex supports their computer with optional 32-column printer, telephone modem and 16K memory expansion module. Software for business, education and personal use will be available, according to the company.

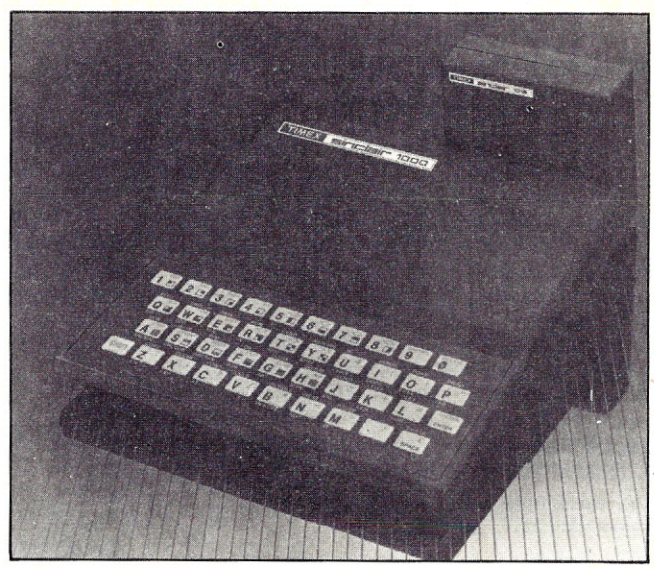
The Timex Sinclair 1000 is an enhanced version of the Sinclair ZX81; it features an expanded 2K-byte static memory. It uses any black and white television as a monitor, and loads programs from a cassette tape recorder. Reader Service number 445.

TRS-80/PMC-80 Memory Expansion

Imagine an economical



The Model 80Z Professional Drum Plotter from X and Y Enterprises.



The Timex Sinclair 1000 computer, shown with optional 16K memory expansion module.

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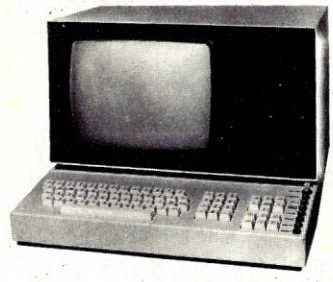


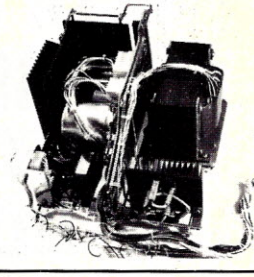
12" Green Ball Brothers monitor with enclosure measuring 19" × 16.5" × 14". Room inside to mount a Ferguson single board computer or small SS-50,S-100 system. (Power supply available, see below.) Requires +15 volts DC. @ 1.5 amps, noncomposite (separate sync) input. A sync separator schematic is available. It is also possible to mount a single 8" disk drive or two of the new slim line 8" disk drives in this enclosure. All units are used, and have been 100% tested.

Shipping weight 35# $65.00

ASCII Keyboard (used) with enclosure to match above monitor. 77 keys, 7 lighted pushbuttons, on/off sw. Requires 5 volts DC. Schematic included. Includes shift, tab, control and cursor control keys. Size; 19 × 4 × 5½.

Shipping weight 8# $35.00

Modular power supply (missing regulator card) fits inside above monitor enclosure. Includes large transformer that outputs +8.5 volts @17 amps, +/−18 volts @1.5 amps each, +15 volts @ 1.5 amps (for monitor), three large capacitors (1-18kuf, 2-8kuf), 1–30 amp, 2–3 amp bridge rectifiers. The transformer and rectifiers/capacitors make a perfect unregulated SS-50/S-100 power supply. The schematic for the regulator card is available.



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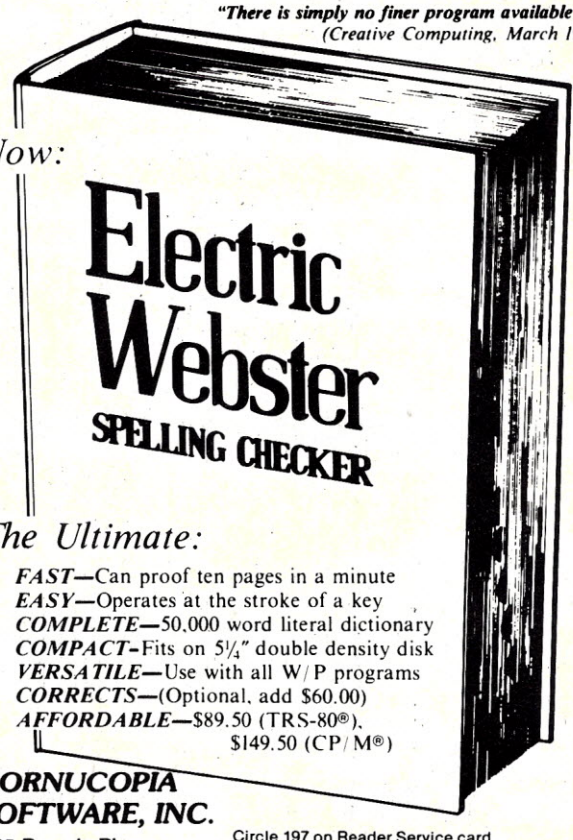

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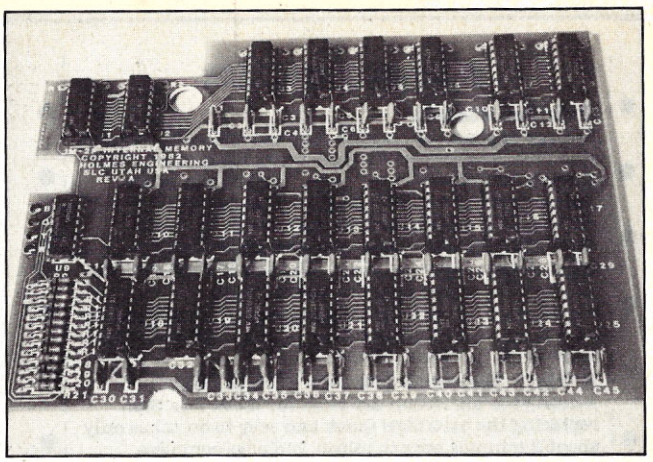


The Internal Memory from Holmes Engineering upgrades TRS-80 and PMC-80/81 computers.

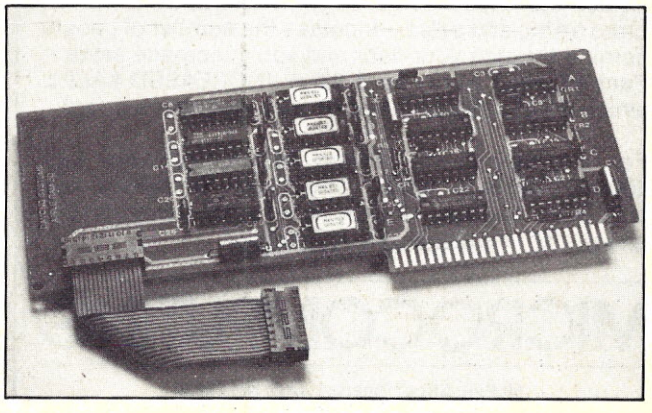
memory system that expands your memory capacity up to 48K without an expansion interface. The Internal Memory by Holmes Engineering, 3555 S. 3200 West St., Salt Lake City, UT 84119, plugs into the RAM sockets in your system, so you don't use cable connectors. The IM runs reliably at high speeds, avoids reboots and data losses and doesn't overload power supplies. Three models are available: The IM-1 upgrades a TRS-80 Model I with 16K to 32K and costs $86. The IM-2 for TRS-80 Models I and III has a 48K capacity and costs $139.50. The IM-2P for the PMC-80/81 also has a 48K memory capacity and costs $139.50. Reader Service number 480.

Memory Expansion For Apple II

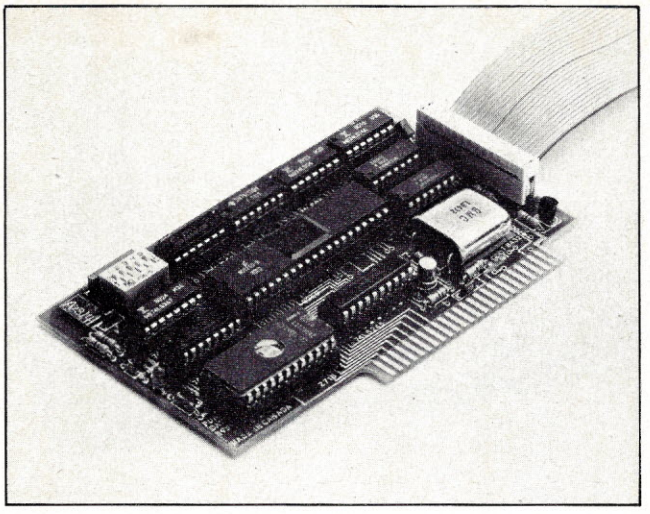
Davong Systems, Inc., 1061 Terra Bella Ave., Mountain View, CA 94043, announces a 16K RAM expansion card for Apple II computers. The card features extended burn-in for high reliability. The DSI 16K expansion costs $99. Reader Service number 475.

Ready Reference

System reference cards for Apple microcomputers are offered by Nanos Systems Corp., PO Box 24344, Speedway, IN 46224. These cards are accordion-foldup style, on 80 lb. stock. There are two cards: The Basic-only card is designed for the classroom and for those who do not want to work with 6502 language; it includes 48K memory map with important addresses, Integer and Applesoft statements and functions, derived functions for making better graphics and other information summarized from the Apple manuals; it costs $3.95. The Basic-and-6502 card also includes instruction length and cycles reference, condi-



Davong Systems, Inc.'s 16K RAM card.



Interplanetary Computer Systems' PDA232C I/O card for Apple.

tion testing information and other 6502-specific references; it costs $4.95. Reader Service number 466.

Hard Disk for the Apple

A 5M Winchester disk system package for Apple II microcomputers has been introduced by Xebec, 432 Lakeside Drive, Sunnyvale, CA 94086. The package is sold in kit form and requires simple assembly. Included are a single board controller, host adapter card, power supply, cable set, cabinet, software and documentation. Price is $1299. Reader Service number 464.

Apple Communications Card

The PDA232C card is a versatile serial I/O card for the Apple II computer. On-board firmware provides three operating modes: I/O mode, terminal mode and remote mode. By interfacing various RS-232C devices such as printers, terminals and modems, this card expands the usefulness of your Apple. Price is $179, Canadian.

Interplanetary Computer Systems Ltd., 950 Denison St., Unit 17, Markham, Ontario L3R 3K5. Reader Service number 476.

Random Projections

The Model 140-RS Interface drives a random-access slide projector through the RS-232C port of a microcomputer. A new Interface package, designed to convert an asynchronous-serial data stream into signals usable by a Kodak RA-960 or Mast 137-S4 slide projector, is available from Mast Development Company, Davenport, IA 52803. Minimum memory and programming are required for the

The Xebec hard disk kit for Apple II.

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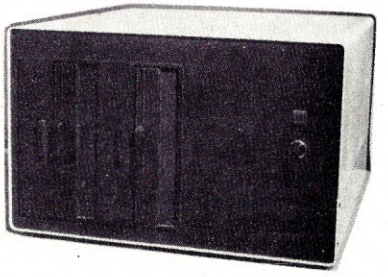

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ROM kit for industrial computer which allows programming of 2716 EPROMS, kit includes 1 personality ROM, 1 2K X 8 RAM, 1 2K Monitor - $60.00.

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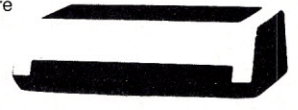

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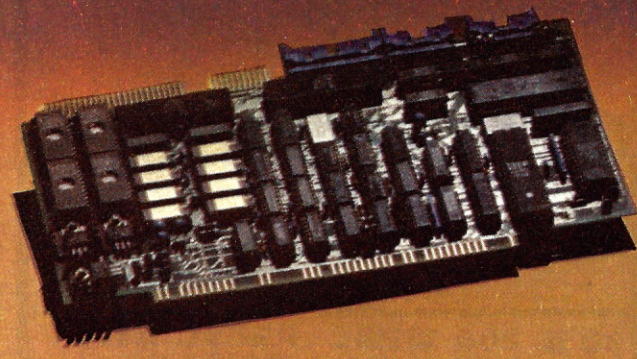

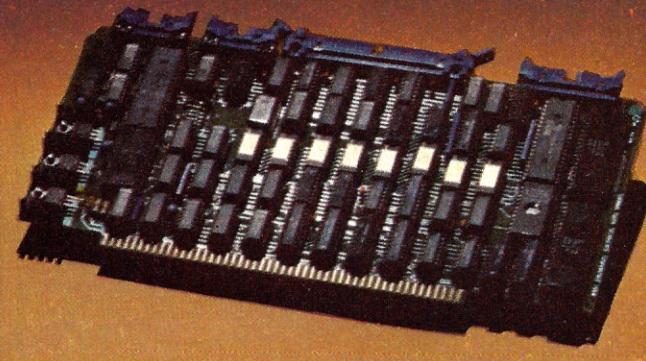

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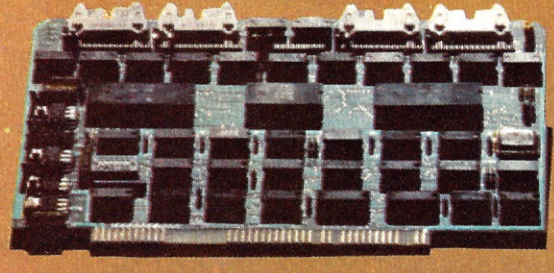

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ZSIO 4 Port RS-232
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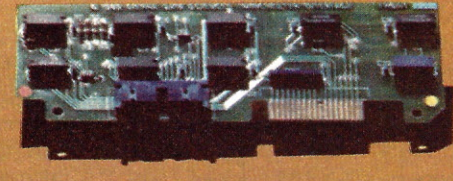

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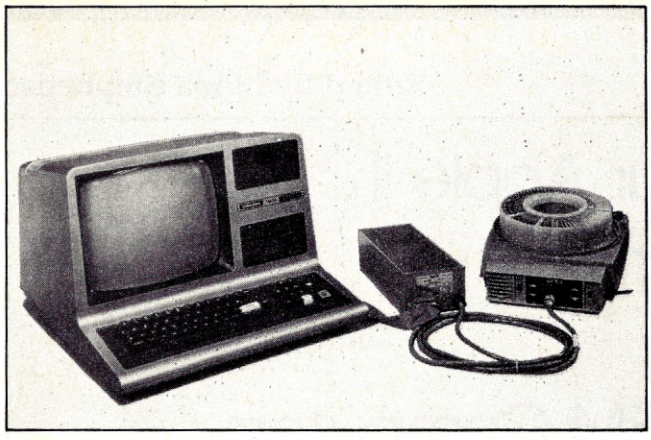


The Mast 140-RS slide projector interface plugs into any RS-232C computer port.

computer to control all functions of the projector, including on/off and random slide retrieval. Any of 81 slides can be found and projected within 3½ seconds; average search time is 1½ seconds. The system is useful for audio-visual presentations and interactive learning. You can create branching teaching programs using existing slides. Price is $600.

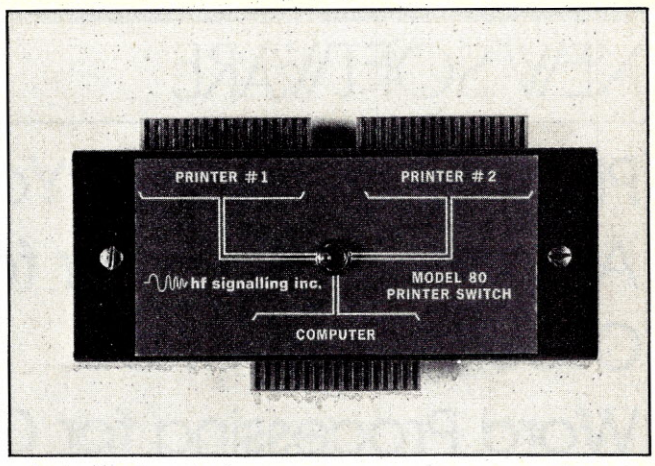
Mast Development Company, 2212 East 12th St., Davenport, IA 52803. Reader Service number 477.

Green Screens

A new line of low-cost, high-resolution green phosphor display monitors has been introduced by USI International, 71 Park Lane, Brisbane, CA 94005. The nine-inch Pi-1 unit has a minimum 64-character by 16-line text display; the 12-inch Pi-2 model has an 80 character by 24-line text display. Both units feature computer-matched styling, brightness control, antireflective screen and LED power indicator. Connection to both is via a standard SO-239 connector or an RCA phone jack. The units come with a cable adapter, allowing simple connection to most micros on the market. The Pi-1 costs $249 and the Pi-2 costs $275. Reader Service number 478.

Added Convenience For TRS-80 Systems

HF Signalling, Inc., PO Box 17510, Kansas City, MO 64130, announces their Model 80 line printer switch. Designed for TRS-80 Models I and III, this switch lets you select either of two separate line printers connected to your computer, without changing cables. The Model 80 is a compact module that plugs into the printer port of your computer and provides an edge connector for both printers. Price is $55. Reader Service number 472.

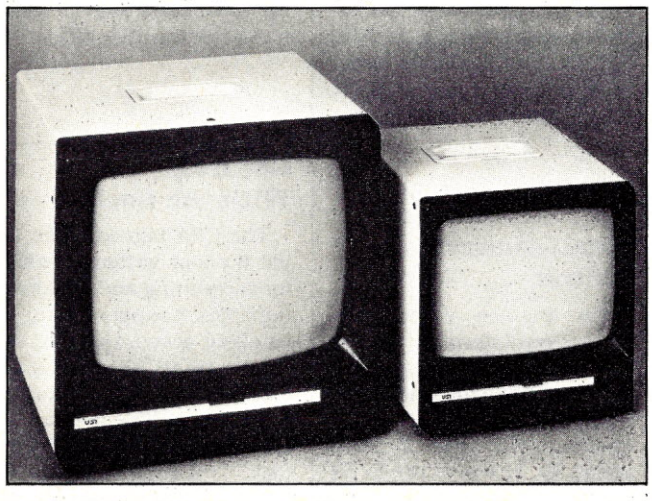


The Model 80 line printer switch from HF Signalling, Inc.

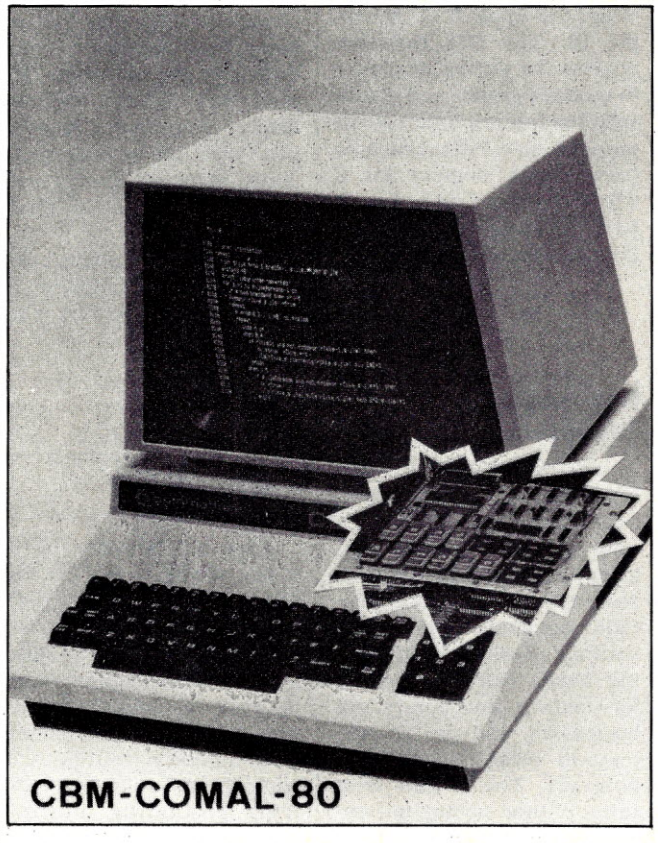
Commodore Graphics

COMAL-80 is now available on a 64K PROM board for PET and Commodore computers. The CBM-COMAL-80 board is simply plugged into the computer to automatically bring up COMAL-80 graphics capability. The COMAL-80 language has proven itself in educational and business applications; it combines Basic's simplicity with Pascal's powerful programming structures. Basic remains available by typing the command BASIC, so that standard word processing and other software can still be conveniently run.

Instrutek, Christiansholmsgade, DK-8700 Horsens, Denmark. Reader Service number 479.



USI's new monitors feature green phosphor screens.



The CBM-COMAL-80 board installs COMAL-80 graphics in your PET or CBM computer.

NEW SOFTWARE

Edited by Linda Stephenson

Plan Your Route on Your Apple II
A Terminal Emulator for Atari
Osborne 1 Software
Word Processing for CBM Computers

Better Graphics

A new package from Business & Professional Software, Inc. (BPS), 143 Binney St., Cambridge, MA 02142, lets you create business graphics displays on an Apple computer and then print the images with any of more than 20 printers and plotters. The printer/plotter installation kit is called PIK, and it is used to modify BPS's master business graphics package or Apple Business Graphics (marketed by Apple Computer, Inc.) for either the Apple II or the Apple III. The PIK software enables the printer or plotter to produce graphs and charts with the full resolution of the output device. PIK is available from Apple dealers for a $50–$75 installation fee or $150 purchase price. Reader Service number 481.

Spreadsheet Templates

VisiCorp (formerly Personal Software, Inc.), 2895 Zanker Road, San Jose, CA 95134, is now making available finished, generalized financial models for its popular VisiCalc spreadsheet program. VisiCalc Business Forecasting Model can be used for forecasting and analyzing businesses, and can be customized using the VisiCalc program. The model is a series of time-saving, interrelated VisiCalc worksheets which exchange information and together provide most reports needed. Results of analysis performed within each of the worksheets are transferred to specific locations on other worksheets. Price is $100. Reader Service number 482.

Hard Disk Backup

Backup is a fast and convenient program that lets hard disk users back up their CP/M 2.x files onto floppy disks. Backup employs a unique scheme to copy files that are larger than the capacity of a disk onto several disks. The package includes a directory display program that provides you with an alphabetically sorted directory listing with file sizes and available space remaining.

Tri-L Data Systems, 900 Fort St., #50, Honolulu, HI 96813. Reader Service number 483.

Routeplanner For Apple II

Columbia Software, 5461 Marsh Hawk Way, PO Box 2235 Columbia, MD 21045, has introduced a software package for people who like to plan ahead. Routeplanner will help anyone who plans business and sales trips, pickup and delivery routes, van pools, transit routes or other trips containing multiple stops. Routeplanner accepts up to 21 route stops whose map coordinates are determined. After optional route adjustments are made, Routeplanner computes the order of stops and approximate distance for the shortest trip. The package also contains a database program to store map locations of up to 400 accounts, streets, cities and so on. To save time and mileage, Routeplanner may be the answer. Price is $149, available for the Apple II with 48K, Applesoft and disk drive. Reader Service number 484.

Professional Time Management

Integron Systems, 300 West 109th St., Suite 2J, New York, NY 10025, has released Sundial, a time-management system that maintains appointment lists, generates cross-referenced schedules and analyzes hourly billing for any number of users. Currently available under the Oasis Operating System, Sundial will soon be available under CP/M and Unix. Price is $400. Reader Service number 485.

Small-Business Billing

The Invoice Writer program, from Information Intelligence, Inc., PO Box 31098, Phoenix, AZ 85046, helps the small-businessperson prepare invoices and bills. It holds about 80 invoices, prints its own forms, permits corrections and additions, provides for taxes and discounts, and maintains an accounts receivable file. An Apple II with one or two disk drives and a printer are needed. The program is menu-driven and easy to use. Price is $64.95. Reader Service number 486.

Atari Datacom

A powerful terminal emulator package for Atari 400/800 is now available from the Binary Corp., 3237 Woodward Ave., Berkley, MI 48072. T.H.E. Smart Terminal, an assembly-language program, will run on cassette or disk systems. The program lets Atari users communicate with any of the popular data services, such as The Source, Dow Jones and CompuServe. The user can create files offline for transmission at higher data rates and at more convenient times. T.H.E. Smart Terminal costs $49.95. Reader Service number 487.

Get Help With the Books

The CPA Partner is an Apple II client writeup package for accounting and bookkeeping firms. It supports integrated client accounting and billing for up to 250 clients and features easy-to-use screens and menus. The package requires 48K RAM and a hard disk. CPA Partner includes a general ledger module with up to 300 accounts, 99 depart-

ments, 1900 double-entry vouchers per month and 15 recurring journal entries for repetitive posting. Budget and comparative reporting is provided, in addition to customized balance sheets, income statements, funds statements and trial balances. Price is $2000.

Management Information Services, 4966 El Camino Real, Suite 107, Los Altos, CA 94022. Reader Service number 494.

Full-Service Brokerage

The Micro-Broker was designed by stockbrokers, for stockbrokers, to automate their business. The system operates on an Apple II. Micro-Broker provides complete portfolio management and reporting. It interfaces with the Dow Jones News and Quote Retrieval Service to automatically update security prices; the prices are then reflected against portfolio transactions. The broker can maintain a database of business contacts to categorize clients and prospects for instant access and for printing mailing labels. Micro-Broker is priced at $2000.

Applied Micro Sciences, 16 Pine Hill Road, North Scituate, RI 02857. Reader Service number 488.

Bowling Data System

Rainbow Computing, Inc., 19517 Business Center Drive, Northridge, CA 91324, announces Bowling Data System 2.0, a database program for league secretaries. The system stores and computes data for multiple and/or mixed leagues of up to 40 teams of six bowlers per team. For each team a cumulative record is kept of total pins, games won and lost, total points, high series and so forth. Similar information is maintained for each bowler, as well as high game, handicap and other data. The package requires Apple II Plus and an 80-column printer. Price is $149.95. Reader Service number 489.

Show and Tell

Executive Briefing System (EBS) is a business and professional graphics package for the Apple II. EBS creates bootable disk slide shows which will run automatically or can be controlled from hand controllers or the keyboard. Viewing time, multidisk wraparound and special effects such as curtains, dissolves, spirals and cuts can be preprogrammed or specified midshow. The user can add text or line drawings to high-resolution images created by VisiPlot or other graphics packages. Price is $199.

Lotus Development Corp., 180 Franklin St., Cambridge, MA 02139. Reader Service number 490.

Real Estate Templates

The Quikcalc Real Estate Investor, from Simple Soft, Inc., 480 Eagle Drive, Suite 101, Elk Grove, IL 60007, helps the user evaluate potential real estate sales or purchases. Separate models are provided for individual residences and for income properties. This template model for 64K micros using either VisiCalc or SuperCalc is currently available for Apple II 3.3 DOS, IBM PC and Osborne 1 computers. Price is $129.95. Reader Service number 499.

Play the Market

Now you can lose your shirt on Wall Street and walk away smiling. Computer Stocks & Bonds, a new game from Avalon Hill, offers a no-risk investment experience to owners of Apple, Atari, TRS-80 and PET computers. With an initial $5000 stake, you and your friends can speculate in shares of nine different corporations, or salt some of your money away in safe municipal bonds. Will you opt for slow but steady capital appreciation and the secure dividends of a public utility or mutual fund, or go for more spectacular growth in the glamour industries? Invest $20 (in real money) and try your luck.

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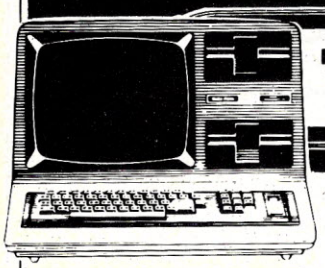

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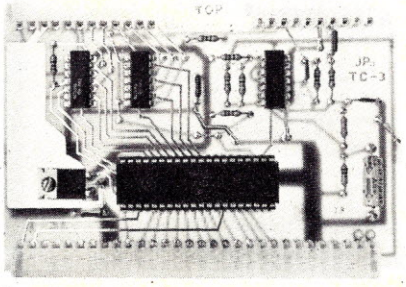

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pany, 4517 Harford Road, Baltimore, MD 21214. Reader Service number 496.

Applesoft Utility

Amper-Magic for the Apple II gives Basic programmers the ability to add machine-language routines to Applesoft programs without the need to know any machine-language. This menu-driven utility uses the ampersand function to access machine-language routines by name. Your Basic program can then pass variables back and forth to the routines exactly as you would do in Basic; no pokes or peeks required. Amper-Magic with 23 machine-language routines is priced at $75.

Anthro-Digital, Inc., 103 Bartlett Ave., Pittsfield, MA 01201. Reader Service number 495.

Software for The Osborne

Eleven software products for the Osborne 1 computer, including graphics games, 50,000-word spelling proofreader and programming languages, are available from The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423. The MYCHESS championship level chess program features a full graphics board display. Also offered are the original Adventure game, the Eliza "therapist" and arcade-style video games. Programming languages include C, RATFOR, Lisp and macro assemblers for Z-80 and 8080 op codes. Programs are priced from $19.95 to $49.95. Reader Service number 497.

Apple Nutrition

The Eat Smart nutrition program, written for the Apple II, analyzes what you've eaten during the day and tells you how to shape up your diet. The program analyzes up to 136 foods in terms of their percentage of the Recommended Dietary Allowances of eight key nutrients; the RDA is based on age and sex. Calories and total milligrams of sodium and cholesterol are also given. The $19.75 price includes a nutrition educator's guide and other materials. Available by direct mail only.

Eat Smart Kit, The Pillsbury Company, 3286 Pillsbury Center, Minneapolis, MN 55402. Reader Service number 492.

CBM Word Processing

Two new word processing packages are offered by Professional Software, Inc., 51 Fremont St., Needham, MA 02194. WordPro 2 Plus runs on any Commodore computer with a minimum of 16K memory, and is supplied on both cassette and disk for $199.95. WordPro 5 Plus is for the Commodore 8032 with 64K expansion board. WordPro 5 Plus supports multiuser systems and many business-oriented programs; it costs $450. Reader Service number 493.

Educational Networking

The Classroom Monitor is an educational/training software package that brings the advantages of local area networks to the classroom. The software creates a teacher's workstation to control and monitor a classroom of 64 Apples on an Omninet network. The teacher's workstation acts as a shared peripheral controller, providing the network with disk-sharing and printer-sharing capabilities. The teacher can set up a programming demonstration on one student Apple and let other student Apples monitor that screen. He can look at any student's display on the teacher's monitor, and he can download every student station from a single disk located on the teacher's disk drive. Price of Classroom Monitor is $375.

Software Connections, Inc., 1800 Wyatt Drive, Suite 17, Santa Clara, CA 95054. Reader Service number 498.

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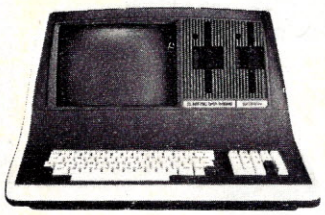

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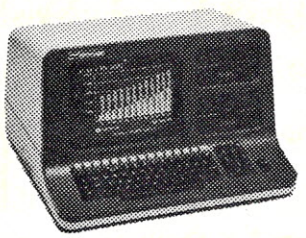

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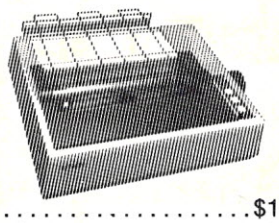

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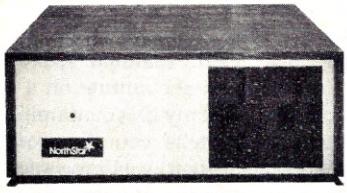

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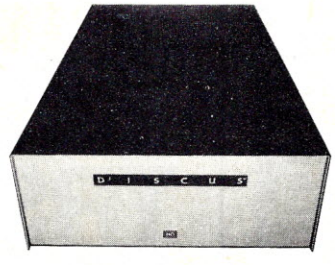

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REVIEWS

(from page 162)

the root of the word to the dictionary.

There are two other ways to use Spell. In the Lookup mode, unrecognized words are listed to the screen. You have no opportunity to make corrections or additions to the dictionary. You might want to use this method when you have many names of persons or places on the list and don't want to take the time to go through them individually.

However, if there are more items than your screen has lines, these words will move by faster than you can read them. You will still have to go back through the text for misspellings. The other alternative is to have the misspelled words placed in a file for later reference.

Spell will run on Heath computers as well as CP/M systems. It will process files produced by most text editors and words processors.

The documentation is compact, well written and very complete. To use the program, you simply type SPELL followed by the name of your file.

A series of switches is provided so that you can easily create new dictionaries of special terms or new tables of prefixes and suffixes, change the marker character, alter the designation of the backup file created when you run Spell or change the character assumed to denote a text formatting command. The theory of the hash coding technique used to create the program is described and information given on patching the program with a list of patch locations.

The program is not infallible. I save a lot of time catching typos and subtle misspellings with Spell. Claimed lookup speed is 4000 words per minute on a 4 MHz machine. One of my files containing 8041 words (Spell tells you the word count of your document) was processed in just over two minutes, almost exactly on target.

Spell is a real workhorse. For the price, ease of operation, speed and minimal disk file requirements, you can't afford to be without it.

(The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423. $49.95.)

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Well, Apple owners, be of good cheer: a first-aid kit called Apple-Aids is here to help. Apple-Aids is a series of 12 utilities for the Apple II; these utilities take care of a number of Apple II disk problems (including one or two you might not know you had!).

For example, Apple-Aids can increase a disk's storage capacity by 6K to 8K, depending on whether you use DOS 3.2 or 3.3. It does this by erasing part of the DOS image normally placed on each disk by the Apple DOS; the disk loses the ability to boot the system, but in all other respects it behaves normally.

Apple-Aids can also show you graphically just how much of the storage space on your disk is being used, and it can give you two different kinds of file directories.

One directory lists each file, and shows which sectors that file occupies. This directory can be a prelude to examining and possibly editing the files on a disk sector by sector—and Apple-Aids can examine and edit files sector by sector.

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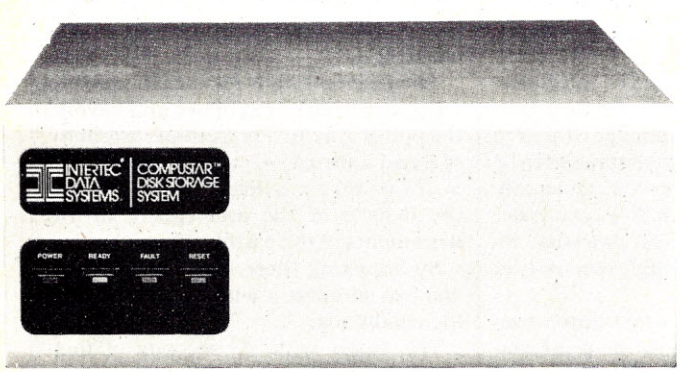

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The other directory lists the name of each file, including deleted files. It tells what kind of file it is, and for machine-language files gives the starting address and the length; and it tells whether the file is locked or unlocked.

If you're unfamiliar with what happens when the Apple II deletes a file, it may surprise you that Apple-Aids can list deleted files. Actually, the delete command does not erase a file; it merely "deactivates" the file so that you no longer have access to it. But until you write over the old file with a new one, the deleted file is still physically present on the disk.

Thus, Apple-Aids can list files that have been deleted. Moreover, it can restore deleted files—unless those deleted files have been written over by new ones.

Apple-Aids can also copy disks, including "uncopyable" disks, provided they use the standard DOS format; but since most "uncopyable" disks now use non-standard formats, this utility is not useful if you plan to be a disk pirate.

One Apple-Aids utility can convert numbers from one base to another—binary, octal, decimal and hexadecimal. A couple of other utilities help you create and edit Apple EXEC files.

But Apple-Aids' avowed main purpose, and certainly its showpiece utility, is its disk editor. This utility can load from or write to any sector of any track; edit in either decimal, hexadecimal or ASCII; disassemble any sector, using standard 6502 mnemonics; and toggle between the CRT screen and the printer.

The disk editor will be useful mainly to machine-language programmers, since it can be used to list and edit machine-language programs. In theory, the editor can also be used to list and "repair" programs in any language; but the programmer doing this will have to be completely familiar with how the particular language is stored on a disk.

You will discover, for example, that Basic programs stored on a disk contain "inverted" (black on white) characters; you'll have to know their ASCII equivalents and their purposes before you try editing them.

Still, the disk editor could be a disk-saver for disks that have suffered electronic (rather than physical) damage. If you're lucky and know what was supposed to be in the "damaged" bytes, you can simply edit the damage out; at the very least, you should be able to list out what remains and painstakingly reconstruct your programs.

Apple-Aids also has a text dump routine that is separate from the print routine in the disk editor utility.

In general, Apple-Aids is user-friendly, and it does what it is supposed to do. You're presented with a simple menu at the beginning of each routine, and the directions within each routine are usually clear. Users with one disk drive will have to shift between the Apple-Aids and the disk they're working on, but they are probably resigned to this procedure by now anyway.

User errors are trapped efficiently most of the time, and you're given directions for recovery. But you should still be cautious; the program is powerful, and it is easy to make unintended changes in your disk. It is best to follow the advice of the user's manual and have a backup copy of any disk you're working on.

The user's manual is concise, but clear and reasonably complete. There is no tutorial, but numerous illustrations show how the screen looks during the various routines. Perhaps the most serious omission is that you're not warned to cover the "write protect" notch of the Apple-Aids disk itself.

So if you're a serious programmer and your disk drives are the backbone of your system, and you have (or anticipate having) disk problems, give Apple-Aids a try. It may be just what the doctor ordered.
(Advanced Operating Systems, 450 St. John Road, Michigan City, IN 46360.)

Brownlee Elliott
Bloomfield Hills, MI

Alien Lander, Retro-Ball

Sierra software
Unwraps a package
For game players

Alien Lander is a single-player game billed as a 3-D landing simulator. While not truly three-dimensional, the landscape is drawn in perspective that changes with altitude, giving a somewhat 3-D appearance. You start the game by booting the disk, which then remains in the drive since it will be accessed later.

Before entering the game proper, you must set the conditions for the planet on which you will be attempting to land. Press a number key from 1 to 9 to set gravity. Each increment is equivalent to 1/6 of earth gravity. Pressing the 6 key sets gravity equivalent to that of the earth, or 1.

The next setting is for thrust, again in 1/6 g increments, but above and beyond the pull of gravity. For example, a gravity of 6 and a thrust of 3 would equal (6 + 3) × 1/6, or 1½ g's of thrust. You next enter the density of the atmosphere in 1/6 increments of the earth's atmosphere.

By adjusting these three parameters, you can simulate a wide variety of landing conditions.

You begin with 90 seconds of fuel. Burning the fuel slows the rate of descent. Fuel is burned by entering a number between .01 to 99.9 into the fire register, then pressing enter or by pressing either of the buttons on the game paddles.

The viewpoint is from inside the ship, looking at a viewing screen. Along the

bottom is a "digital instrument panel," which keeps you informed of altitude, velocity, fuel being burned, the time and remaining fuel. Initially, the view shows a space background and, as the altitude decreases, the landscape comes gradually into view.

The ship's "onboard computer" is activated by pressing I or A. I is Inquire Mode, and returns the ship's current status. A provides advice on correcting problems which may have been encountered in the Inquire Mode. The screen is continuously updated while in either mode, and return to normal video is accomplished by pressing the space bar.

If your velocity gets too high, the ship will overheat. Twenty seconds of this without slowing the rate of descent will cause the ship to burn up and explode in the atmosphere.

A landing velocity of 60 kph will get you down alive, but the ship will be permanently damaged. A safe landing velocity is 0–29 kph.

After landing, press the F key to take off again, but don't wait too long—you may have some "company" outside.

***

Retro-Ball is a simulation of Air Hockey with a new wrinkle—the puck has a rocket attached to it.

Retro-Ball uses the Apple game paddles and also requires that a modification called Videosync be installed in the Apple. This is merely a jumper that goes between the Apple's auxiliary video pin and the cassette-in jack. The jumper is supplied with the proper plugs attached and takes only a moment to install. The game will not run without it.

Videosync monitors the Apple's video output through the cassette port, keeping track of where the scan line is on your video monitor or TV. The program thus knows when to draw and when not to draw on the high-resolution screen, resulting in extremely smooth, unflickering motion.

Play can either be by two people or by one person against the computer. The playing field is a rectangular court with a white line dividing the center, and a small white rectangle at each end representing goals.

The game begins with a toss-up on the center line, with both players having partial control at this time. Full control is gained by turning the paddle knob and simultaneously pressing and releasing the paddle button continuously.

Points may be scored by shooting the ball into the center of the opponent's goal and, secondly, by forcing your opponent to hold the ball more than four seconds.

Turning the paddle knob rotates the ball, orienting the direction of the rocket. Pressing the button fires it. This isn't a game to be mastered in one sitting—it will provide many hours of enjoyment.

For Apple II disk system owners both games are well thought out, with excellent color graphics. Packaging ranks among the most attractive I have seen, consisting of a large plastic envelope with a colorful insert showing through. Player's manuals are included with both games.

Retro-Ball is priced at $29.95 and Alien Lander is $24.95. Sierra Software is at 536 East Sahara Avenue, Las Vegas, Nevada 89104.

For the acid test, I took these games to The Software Center in Florissant, MO, and collared two game players named Rich and Terry, ages 13 and 15, respectively. After several rounds, both agreed that the games were interesting and not too easy to make one tire of them quickly.

What greater accolade could one desire than this from two experts?

(Sierra Software, 536 East Sahara Ave., Las Vegas, NV 89104. Alien Lander, $24.95; Retro-Ball, $29.95.)

Ronald Bobo
St. Louis, MO

Lucidata Pascal

The best Pascal
For Heath
Gets even better

When I wrote a review of Polybytes' implementation of Lucidata Pascal Version 2.8 for the Heath/Zenith computers (April 1982, p. 203), I felt this was the best Pascal I'd found that allowed me to make maximum use of the Heath Disk Operating System (HDOS) features. However, I have changed my mind, since Polybytes has released Lucidata Pascal Version 3.8, with great improvements.

One of the most important changes was to make this new version available in CP/M as well as HDOS formats. Both versions use ten-sector, hard-sector 5¼-inch disks, but most Heathkit Electronic Centers and many other commercial and private sources can convert from those formats to others. The 8080/Z-80 microcomputer user can run this cost-effective Pascal on most disk systems, and take advantage of his favorite editors and other utilities that would normally not be available to users of p-code Pascal.

Version 3.8 makes full use of David Gibby's P-6800 Pascal p-code generating compiler. It includes a run-time package for the Heath H8 and H89/H90 computers running under HDOS. For the CP/M version, the run-time package presumably interfaces with CP/M's BIOS (Basic I/O System).

The run-time systems are provided in both 8080 and Z-80 code, allowing total compatibility between the H89 and H90 with their Z-80s and the older H8 with its 8080. The former can use the slightly faster Z-80 run-time package, while the latter can run the same programs using the 8080 run-time package. This approach prevents the Pascal package from becoming dated as 8080 users upgrade to Z-80 processors.

Lucidata Pascal is a subset of the ISO Standard Pascal, with certain input/output enhancements added to make practical programming easier and, in this case, to make fullest use of the capabilities of HDOS. The data type REAL is supported, but RECORD is still absent (you will have to do your own defining to get this feature, which is not a real problem).

Procedures, functions, multi-dimensioned arrays, recursion and file types are all supported. All the branching constructs are present, including IF..THEN..ELSE and CASE..OF. REPEAT..UNTIL and WHILE..DO are present, as are the data types CHAR, BOOLEAN, INTEGER, BYTE and ALFA (a six-character string) and scalars, which can be members of SETS. New to Version 3.8 are the procedures NEW, MARK, RELEASE, SQRT, SIN, COS, EXP, LN, ARCTAN, ASSIGN and OVERLAY.

Lucidata Pascal provides the standard I/O procedures of RESET, REWRITE, READ, WRITE, POSITION, READLN and WRITELN; now ASSIGN has been added. HALT is available, and you have the ability to define USER functions to pass control from a compiled Pascal program to the user code. The normal ordinal and predicate functions of CHR, ORD, SUCC, PRED, ODD, EOLN and EOF are provided, as are CARD, UNPACK, INPORT and OUTPORT, and the standard arithmetic and transfer functions such as ASB, SQR, TRUNC and ROUND.

New to this version are the constant CHAR (for example, you can define BELL = CHR(7)). You may now write ALFA = ARRAY [1..8] OF CHAR SET [null..rubout] OF CHAR. Version 3.8 responds to lowercase as well as uppercase, and recognizes comments delineated by brackets { } as well as (* *).

The data type POINTER has been added. This was possibly one of the most significant omissions in the earlier versions. CASE now allows multiple labels and OTHERWISE, and Boolean relationals may now be applied to RECORD and ARRAY types.

Many other features have been added. Parameters are now fully type-checked and may be passed by reference (VAR). A $INCLUDE directive has been included for inserting additional files at compile time, and $GEN has been added to allow binding of p-code to a minimal run-time package to save memory space when things get tight.

And things will get a bit tighter now, as the compiler takes 130 HDOS sectors (up from 99), which equates to about 33K bytes of disk space. Two drives are now almost essential (although you can get by with one, with some switching of disks), and you'll need 56K of RAM to prevent paging of the files. The virtual memory feature has been retained, however, and

if you can abide the additional waiting during compilation, you can run in as little as 32K.

Also new is the ability to declare any number of procedures and functions EXTERNAL and linked to user-provided assembly-language code, replacing USER. FORWARD referencing of procedure and function blocks is now possible, and you may now use formatted print output expressions such as WRITE(X:I:J), where the number X will be printed with I digits, J appearing to the right of the decimal point.

Version 3.8 allows you to allocate address space on the run-time stack or at absolute memory locations by the use of the pragmats $STACK and $ABSOLUTE, replacing PEEK and POKE. (Pragmats are implementation-specific features that are not a part of the ISO Standard Pascal.) Also, SETS may now have up to 128 elements.

The manual, including seven appendices, is now about 90 pages long, and still includes syntax diagrams, a description of the resource utilization, a section on fine-tuning programs and a section on customizing the run-time package. This last makes use of a well-designed patch utility that allows the use of non-HDOS device drivers. The method of altering stack size and memory limits is also covered, and a section is provided that shows how to customize the run-time packages to a greater degree than previously possible.

Included on a diskette (the Pascal compiler, the 8080 run-time package and the Z-80 run-time package require a disk of their own) is a set of demonstration programs that are invaluable as an introduction to this implementation. The programs, ranging from a sample of the use of ALFA to a demonstration of USERCODE, are invaluable as learning tools and an introduction to the spirit and function of Pascal. These demo programs are ready to compile and run, and include a VALIDATE routine to test the compiler and run-time package as soon as you start the system.

Version 3.8 of Lucidata Pascal does not incorporate the built-in graphics commands in Ver. 2.8G. It would, of course, be easy to write your own graphics-handling procedures for any display; this is one of Pascal's strongest features. The modified version that does incorporate these special commands for handling the Heath HA8-3 color graphics board will continue to be made available, and these modifications make Lucidata Pascal nearly the perfect graphics language, quick and easy to write, fast running and fully documented.

(Polybytes, 325 19th Street S.E., Cedar Rapids, IA 52403. $145. Update is $60.)

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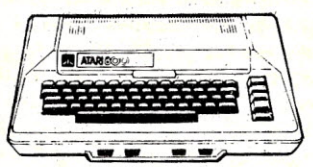

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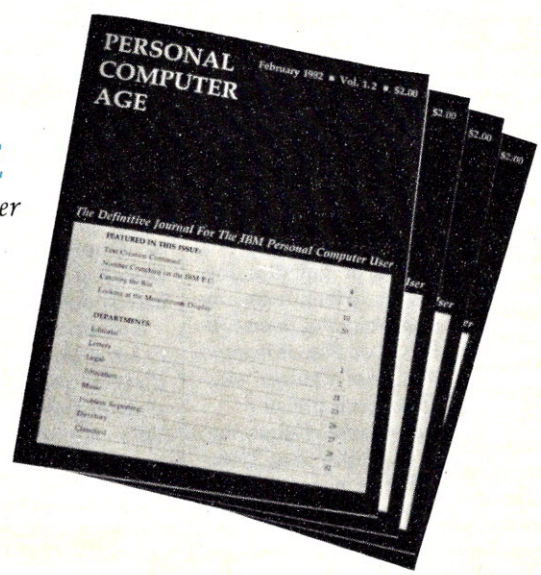

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New, Improved Heath Pascal

DeskTop Plan II

VisiCalc gets a companion
To generate
Financial reports

DeskTop Plan II is a program for preparing and printing financial business reports. By constructing a series of models, any number of "what if" questions can be studied and mulled over.

If this description sounds familiar, don't be surprised. This program is distributed by the same publishing house that brought you VisiCalc, the electronic spread sheet. So, what can DeskTop Plan do that VisiCalc cannot do better?

Both progams perform calculations, but while VisiCalc is set up for almost any kind of mathematics including transcendental functions, DeskTop Plan is limited to the simple arithmetic of addition, subtraction, multiplication and division.

For strictly business applications this limitation becomes a definite plus. Trigonometry has no place in accounting or business trend forecasting. So, there is more room in your computer for report writing, and that is the purpose of DeskTop Plan.

There is space in the program for custom calculations rules, but for this, the ability to program in Applesoft is required.

Desktop Plan II can be a tremendous worksaver. It is easy to learn and use. I constructed a simple personal budget with inflation factors built in, for the years 1982 to 1990, after studying the program for about 20 minutes.

Desktop Plan II shows the calculation rules required to perform the arithmetic. All calculations have to be performed on whole rows or columns. The flexibility of VisiCalc is missing here. However, most business applications result in rectangular formats anyway.

After completing your model and the appropriate calculations, you can go directly to the print module. A very business-like report, including customized headers and footers, is produced.

If you want a pictorial display, there are two utilities for plotting graphs. You can plot simple line and bar graphs directly or convert DeskTop files to Apple Plot files for more complicated configurations. After display, graphs can be printed directly if you have an Apple Silentype printer.

It is also possible to convert VisiCalc files to DeskTop Plan and vice versa. However, if you have a good VisiCalc model and want to use the efficient DeskTop report format, it would seem easier to simply reenter pertinent data into DeskTop Plan rather than go the complicated conversion route.

To convert a VisiCalc file you first have to save it as a /PF file while your spread sheet is in RAM in the Apple. (The manual erroneously lists the command as /PD.) Then, after loading DeskTop Plan again, the conversion utility is brought up. You are prompted through the various steps, but it is easy to misunderstand the questions.

The documentation comes in the well-known padded brown three-ring binder and consists of 200 well-written pages. Many examples are given, but an alphabetic index is lacking.

Minimum requirements for DeskTop Plan II are an Apple II, II+ or III with 32K of RAM, one disk drive, monitor or TV and an 80-column printer. A second disk drive is highly recommended, especially since there is very little room on the program disk for new data. If you have only one disk, it is recommended that you delete all of the Topnotch and XYZ files.

The Applesoft file can also be deleted if you have an Apple II+ or III. The Print AIII file can be deleted if you are using an Apple II. All this deleting will then make space for one or two of your own models. A 132-column printer and an additional 16K of RAM are also recommended.

DeskTop Plan II is handy as a financial report generator. It is easy to use and handy in conjunction with VisiCalc.
(Visicorp, 2895 Zanker Road, San Jose, CA 95134. $199.)

G.R. Brieger
Redmond, WA

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How can you resist a bargain-basement price of $49.95 for a speller that claims to recognize over 50,000 words and requires only 31K? I couldn't, and responded to the ad for Spell.

Spell contains three different dictionaries—one for use with a 64K system, the other two for 48K systems. The run module and the large dictionary require approximately 46K of your disk file space. This is still small enough to tack onto each copy of your word processor without seriously reducing available disk space.

The speller combines basic roots of about 18,500 words with prefixes and suffixes to check an estimated 50,000 words, including common names. This method does permit some odd misspellings to slip by on occasion, although the documentation claims a 96 percent recognition rate when checked against a 42,000 word dictionary. Our experience with the program is that the claimed undetected error rate of 2.2 per 1000 for the 64K dictionary is reasonably accurate.

As with most spelling programs, the usual mode of operation is a scan of the file, then a presentation of each unrecognized word. You have the choice of marking the word for later correction, ignoring it, adding it to the dictionary or adding

(continued on page 156)

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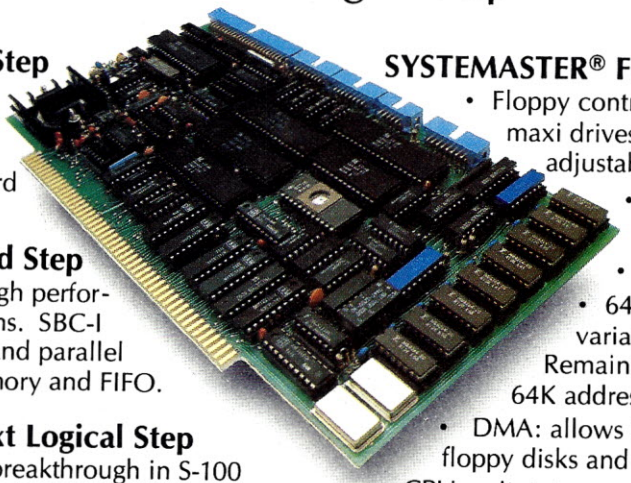

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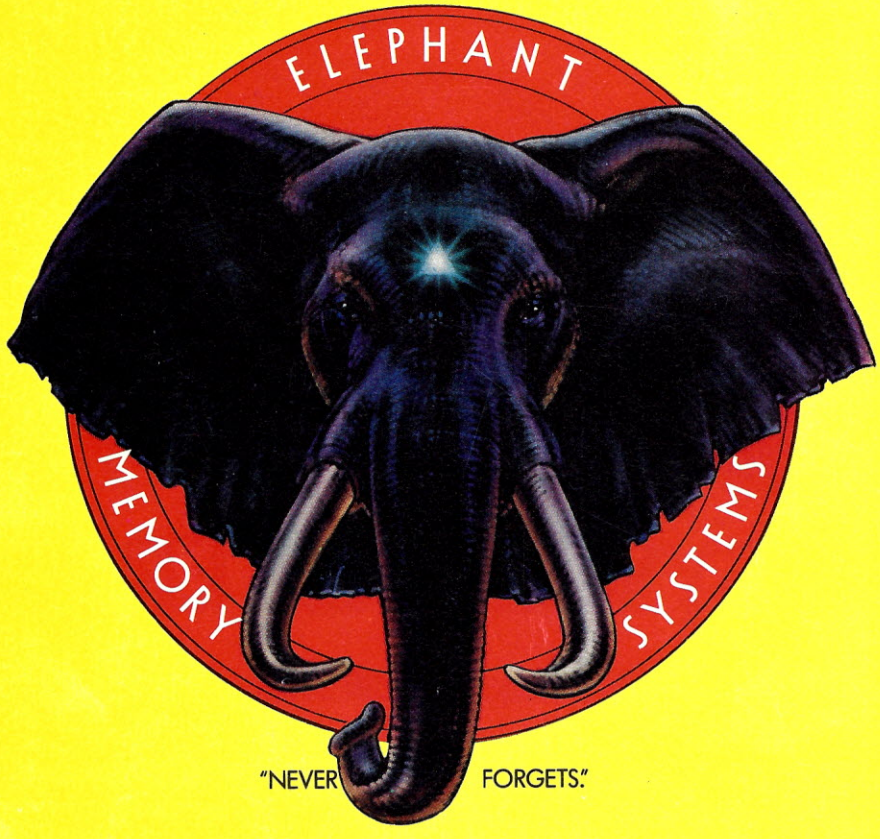

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